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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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78-2251. Kukedi, E. (Agric. Res. Inst., Hung. Acad. Sci., Martonvasar, Hungary) **Results and problems of chemical weed control for wheat in Hungary.** *Acta Agron. Acad. Sci. Hung.* 26: 388-397; 1977. (54 references)

In 1975 herbicides were used for weed control over 1.1 million ha, 85% of the total wheat area of Hungary. The sodium salt of 2,4-D and Dikotex 40 (MCPA) were used. An herbicide containing the same active agent (MCPA) was also available, called 67MA. More effective agents were needed against some weeds so Aniten-M (flurenol), Aniten-D, Banvel M (dicamba) and Gabonil (benazolin) were used. Keropur (benazolin) was also effective. Benval M, particularly when it contains Gabonil, is highly phototoxic. Feneron (bromofenoxim), Suffix (benzoyplop ethyl) and Bidisin (chlorfenprop methyl) were other agents used for weed control. In the first fifteen years of chemical weed control, there was the expected yield surplus of 2-3 g/ha. However, better farming methods in general have cut down on the surplus which can be gained by chemical weed control, and the question of advisability of continued use of the chemicals arises. Problems which have arisen due to phytotoxic effects, varietal sensitivity, resistance, and damage caused by treading are briefly noted.

78-2252. Klein, W. (Inst. Ecol. Chem., Soc. Radiat. & Environ. Invest., Munich, Germany.) **Environmental pollution by insecticides.** *Adv. Environ. Sci. Technol.* 6:65-95; 1976. (10 references)

The potential for pollution by pesticides and by the sum total of human activities with chemicals is reviewed. Major topics considered include the magnitude of changes in environmental quality, with an evaluation given to the importance of environmental chemicals, world production of industrial chemicals, growth factors for the use of chemicals in the Federal Republic of Germany; and major environmental chemicals with attention given to the production of organohalogen compounds. A summary of current knowledge of DDT, toxaphene, parathion, zineb, aldrin and dieldrin metabolism, metabolism of dieldrin in mammals, and storage and excretion of endrin after oral administration to rats are also given. Open air experiments which were conducted on aldrin are reviewed.

78-2253. Metcalf, R. L. (Dep. Entomol., Univ. Illinois, Urbana-Champaign, IL) **Organochlorine insecticides, survey, and prospects.** *Adv. Environ. Sci. Technol.* 6:223-285; 1976. (143 references)

The use and prospects of organochlorine insecticides are reviewed. Organochlorine insecticides, including DDT, lindane and toxaphene, along with the cyclodienes have been important in applied ecology since World War II. The chemical structures of some organochlorine insecticides are noted and the nontarget toxicity of these compounds is briefly discussed. Insecticides included are: DDT, DDD (TDE), methoxychlor, aldrin, dieldrin, endrin, heptachlor, chlordane, endosulfan, toxaphene, lindane, and mirex. The use of organochlorine insecticides in the realm of public health is stressed with significant advances made along these lines through the use of DDT against typhus and malaria. The use of organochlorine insecticides in agriculture and in the home and garden is considered. Insect resistance to organochlorine insecticides is discussed in depth with major emphasis given to the genetics of insecticide resistance and the enzyme DDTase. Environmental contamination brought about by organochlorine insecticide use is considered. Discussion along the contamination line is given to soil persistence of these chemicals, bioaccumulation, their transport through the food web, degradation pathways in the environment, microsomal induction and carcinogenicity. The development of possible substitutes for organochlorines is discussed.

78-2254. Spencer, E. Y. (Res. Inst., Agric. Canada, London, Ont., Canada) **Organophosphorus insecticides.** *Adv. Environ. Sci. technol.* 6: 295-312; 1976. (33 references)

The field of organophosphorus insecticides is reviewed. Organophosphorus chemistry dates back to the middle of the nineteenth century, but the development of organophosphorus compounds for insecticidal activity did not begin until 1936. The biochemistry of these chemicals and their effectiveness was shown to be the inactivation of cholinesterase with the resultant accumulation of acetylcholine producing the characteristic cholinergic symptoms. The influence of various functional groups was soon acknowledged. Rapid developments led to the explanation of toxic activity by enzyme inhibition and metabolic detoxification by hydrolysis. Median lethal toxicity doses for various species and various chemicals are compared. The mixed-function oxidases play a large role in the metabolism of organophosphorus insecticides and also show considerable specificity. In attempts to develop insecticides of greater specificity with low mammalian toxicity, the combined effects of carbamates and phosphoric esters have been investigated by derivatization of insecticidal carbamate esters with dimethyl or diethyl phosphoryl or phosphorothionyl groups. Although the main aim in organophosphorus research is to develop chemicals which are reasonably specific in their activity against undesirable organisms, the detrimental effect on nontarget organisms must not be ignored. Means of modifying formulation and application methods will aid in reducing the amount of nontarget damage.

78-2255. Fukuto, T. R. (Dep. Entomol., Div. Toxicol. & Physiol., Univ. California, Riverside, CA) **Carbamate insecticides.** *Adv. Environ. Sci. Technol.* 6:313-346; 1976. (17 references)

Recent attempts to discover selectively toxic carbamate insecticides are reviewed. These are carbamates which are toxic to insects but relatively nontoxic to mammals; the differences based on rates and routes of metabolic transformations that different chemical moieties undergo in insects and mammals. Particular attention is given to attempts to convert highly toxic methyl-carbamate insecticides into safe materials by derivatization studies. Specific attention is given to *N*- dimethoxy phosphino thioyl-*N*- methylcarbamate esters, biscarbamyl sulfides, and sulfenylated carbamate esters.

The incorporation of selectophores is considered with emphasis on alkoxy iminomethyl phenyl methylcarbamates.

78-2256. Rivero, J. M. D. (Esc. Tec. Super., Valencia, Spain) **La evolucion de la proteccion vegetal y algunas de sus repercusiones en la lucha contra las plagas. [Evolution of plant protection and its implication in pest control.]** *Afinidad* 33(338): 497-504; 1976. (17 references) (Spanish)

Modern aspects of the management of plant pests are discussed. Modern pest control should include integrated pest management, involving the use of various techniques and methods in an economical and ecologically well-balanced manner. The undesirable toxic effects of pesticides can be reduced by microencapsulation. The toxicity of pesticides varies within a wide range, with the LD50 from 4 mg/kg (ethyl parathion) to 15,000 mg/kg (captan).

78-2257. Zhdamirov, G. G.; Lapina, N. P. (Inst. Exp. Meteorol., Obninsk, USSR) **Materialy k ustanovleniyu predel'no dopustimoi koncentratsii khlorampa v pochve. [Data on determining the maximum permissible concentration of chloramp in the soil. Letter to the editor.]** *Gig. Sanit.* 43(1): 80-81; 1978. (1 reference) (Russian)

Discrepancies in the data on persistence of the pesticide chloramp (picloram) in the soil, reported in *Gig. Sanit.* 41(12): 18-22, 1976 (See *Pesticides Abstracts*, Abstract No. 77-1082) are pointed out. Using formulae for calculating the residual amount of the pesticide, the authors argue that the reported value for picloram persistence is 4-6 times greater than the calculated value.

78-2258. Huff, J. E.; Gerstner, H. B. (Toxicol. Inf. Response Cent., Oak Ridge Natl. Lab., Oak Ridge, TN 37830) **Kepone: A literature summary.** *J. Environ. Pathol. Toxicol.* 1(4): 377-395; 1978. (38 references)

This overview provides a survey of the reference literature on the chemical Kepone (chlordecone). The overview includes information on the history, nomenclature, uses, toxicology, environmental aspects, and epidemiology of the chemical. A chronologic history of Kepone is detailed in the appendix. Kepone is used in a variety of ways, particularly as an insecticide and fungicide. It is effective against leaf-eating insects, but less harmful to sucking insects. It is, however, useful as a larvacide against flies and is an efficacious ant killer. It also controls crop and fruit pests and inhibits the growth of certain microorganisms. The chemical kills by contact and also acts as a stomach poison. Kepone, in combination with pentachlorophenol (PCP) or creosote, is an active ingredient in preservative formulations for protection of wood from rot, termites, or marine borers. Polycarbonates of different inherent viscosities are made fire retardant by addition of Kepone. Kepone has caused serious illness among workers of the Life Science Products Company in Hopewell, Virginia. More than 50% of the employees showed high blood levels of Kepone, and in several instances spouses and children also displayed high blood content of the chemical. Clinical toxicity signs include slurred speech, loss of memory, behavioral changes through brain and liver damage and sterility. Toxicity and carcinogenicity studies performed using animals are reported. The contamination of the James River, its tributaries and the fish therein is reviewed. Various methods for Kepone disposal are discussed.

78-2259. Fadeev, Yu. N. (Author address not given) **Integrirovannyi metod zashchity rastenii i zadachi nauki na blizhaishuyu perspectivu. [Integrated method of plant protection and the tasks of the science in the near future.]** *Khim. Sel'sk. Khoz.* 15(6): 3-8; 1977. (Russian)

Basic principles of the integrated systems of plant protection are reviewed. Such systems should be based on the use of specific agricultural techniques aimed at the inhibition of pest development; selection of the resistant varieties; preservation and activation of natural entomophagic species; and chemical and biological control of harmful organisms. Application of the integrated system decreased the average toxicity of commonly used chemicals, and reduced the treated areas.

78-2260. Tamashiro, M. (Dep. Entomol., Univ. Hawaii, Honolulu, HI 96822) **Susceptibility of termites to microbes.** *Natl. Techn. Inform. Serv.* AD-A029,326; 178p.; 1976. (98 references)

This report concerns the biology, ecology and susceptibility of the Formosan subterranean termite *Coptotermes formosanus* to the insect pathogenic nematode *Neoaplectana carpocapsae.* The nematode *Neoaplectana carpocapsae* entered the termite through the mouth or through the anus. Anal penetration was more frequent than oral. Once in the gut it penetrated the gut wall and entered the hemoceal where it released the bacteria. The termite was killed by a massive septicemia. The nematodes multiplied and emerged from the cadaver. In the laboratory, the pathogen was transferred to a new host but in the field colonies the infection was not transmitted to another host. The same situation obtained with the fungal pathogens, *Metarrhizium anisopliae* and *Beauveria bassiana.* Microbial control of *Coptotermes formosanus* will depend upon discovering a microbe that can be easily transmitted in the colony or a microbe that does not elicit the defensive reaction from the colony. (Author abstract by permission, abridged)

78-2261. Freeman, T. E.; Charudattan, R.; Conway, K. E.; Zettler, F. W.; Martyn, R. D. (Plant Pathol. Dep., Inst. Food & Agric. Sci., Florida Univ., Gainesville, FL) **Biological control of water weeds with plant pathogens.** *Natl. Tech. Inform. Serv.* PB-257,172: 47p.; 1976. (42 references)

Both endemic and exotic plant pathogens were evaluated as biological control agents for water weeds. Additional studies investigated the potential use of an integrated program of biological control using plant pathogens and insects. Of the endemic pathogens tested, *Rhizoctonia solani, Acremonium zonatum* and *Cercospora rodmanii* exhibited po-

tential as biocontrols. The latter fungus was the most promising. In fact, *C. rodmanii* was established as the causal agent of a decline disease which effectively controlled waterhyacinths in Rodman Reservoir in two out of the last five years. It has the additional advantage of being highly host specific for waterhyacinths. The two exotic pathogens showing the most potential were the waterhyacinth rust, *Uredeo eichhorniae* and *Bipolaris stenospila*. Results of the integrated control studies showed that the action of a combination of pathogens and insects would significantly reduce biomass accumulation in waterhyacinth populations. (Author abstract by permission)

78-2262. Addor, E. E. (Mobility & Environ. Syst. Lab., US Army Eng. Waterways Exp. Stn., Vicksburg, MS 39180) **A field test of selected insects and pathogens for control of waterhyacinths. Report 1. Preliminary results for the 1975 - 76 season.** *Natl. Tech. Inform. Serv.* AD-A044,392: 62p.; 1977. (18 references)

During the 1975 growing season a field experiment was begun on Lake Concordia, LA., to test the potential effectiveness of selected organisms as control agents against water hyacinths, *Eichhornia crassipes* (Mart.) Solms. Floating frames, each approximately 2 m sq., were anchored on the lake in open water and planted with locally growing water hyacinths. Sixty of these plots were selected for treatment with various combinations of two insects (*Arzama densa* Walker and *Neochetina eichhorniae* Warner) and two fungi (*Acremonium zonatum* (Sawada) Gams and *Cercospora rodmanii* Conway) in a random block factorial arrangement with four replications per treatment, and four frames were designed as control (no-treatment) plots. All plots were weighed at 2-wk intervals throughout the growing season, flowering stalks were counted, and plant heights were measured at each weighing date. Observations were also made on insect and pathogen populations on the plots during the season. Preliminary indications are that significant reductions in the growth rate or total accumulation of water hyacinth mass in the test plots were not achieved by any of the treatment combinations during the first season's tests, but the potential for some of the treatments to effect the desired control began to emerge during the second year. (Author abstract by permission, abridged)

78-2263. Off. Water Plann. & Stand., US EPA, Washington, DC 20460 **Estuarine pollution control and assessment, proceedings of conference, Vols. I, II.** *Natl. Tech. Inform. Serv.* PB-265,467: 760p.; 1977. (760 references)

This report is designed to provide information that could be used to establish a national program for the prevention, reduction, and elimination of pollution in estuaries. The individual papers comprising the report address important estuarine problems by presenting state-of-the-art knowledge and experience in the field. Volumes I and II contain the conference papers and Volume II is a microfiche index of federally funded estuarine research projects. (Author abstract by permission)

78-2264. Jenifer, F. G. (Biol. Dep., Rutgers State Univ., New Brunswick, NJ) **Studies of the natural relationships of cyanophages and their hosts and the nature of resistance.** *Natl. Tech. Inform. Serv.* PB-270,781: 29p.; 1977. (15 references)

The cyanophages LPP-1 and/or LPP-2 were isolated from 19 natural water bodies of the Rariten River drainage basin in New Jersey. The seasonal flucturations of LPP-1 and LPP-2; and *Plectonema* and 13 other genera of blue-gree algae were monitored for the first time in the same water system. There is a direct relationship between the occurrence of the LPP cyanophage group and *Plectonema boryanum*. This finding suggests that the LPP cyanophages may play a role in the natural control of *Plectopnema boryanum* and are of potential use as biological controls for this algae. These results suggest that if mutants of other blue-green algae develop as rapidly under cyhanophage selection pressure as is the case of *A. nidulans* and if the nature of their resistance is similar, then the use of cyanophages as specific biological controls seems of dubious value. (Author abstract by permission)

78-2265. Harrison, E. A. (Natl. Tech. Inform. Serv., Springfield, VA 22161) **Industrial health hazards due to atmospheric factors. Volume 2. August 1975-November 1977. (Bibliography with abstracts).** *Natl. Tech. Inform. Serv.* PS-77,0977: 161p.; 1977. (156 references)

Industrial medicine, occupational diseases, health of miners, and the toxicological factors of various pollutants are topics covered by the abstracts of research reports in the bibliography. Some pollutants included are manganese, radon, silicon dioxide, explosives, asbestos, platinum, palladium, polyvinyl chloride, nickel, pesticides, chronium, plastics, and vanadium. This updated bibliography contains 156 abstracts, 43 of which are new entries to the previous edition. (Author abstract by permission)

78-2266. Lehmann, E. J. (Natl. Tech. Inform. Serv., Springfield, VA 22161) **Biochemistry and therapy of cholinesterase inhibitors (A bibliography with abstracts).** *Natl. Tech. Inform. Serv.* PB-77,0978: 209p.; 1977. (204 references)

Citations report on cholinesterase inhibitors and reactivators. Most of the studies are concerned with organic phosphorus chemical warfare agents and their effects on cholinesterase. However, some research also discusses insecticides and other toxic chemicals. Along with these citations are abstracts on the effectiveness of several cholinesterase reactivators including aldoximes and pralidoxime chloride. Nerve activity, blood chemistry, biochemical reactions are but a few areas covered. Soman and sarin are the nerve agents studied the most. This updated bibliography contains 204 abstracts, 47 of which are new entries to the previous edition. (Author abstract by permission)

78-2267. Crockett, P. W. (Natl. Techn. Inform. Serv., Springfield, VA 22161) **Biological pest control (A bibliography with abstracts).** *Natl. Tech. Inform. Serv.* PS-77,1180: 94p.; 1977. (89 references)

Research reports are cited on the use of microoorganisms, animals, and insects as agents of pest control. Predator and parasite relationships of the biological agents to insects, plants, and other pests are covered. This updated bibliography contains 89 abstracts, 13 of which are new entries of the previous edition. (Author abstract by permission)

78-2268. Langford, H. D. (Author address not given) **Kepone, mirex pesticide residues persist, full effects unknown.** *News Report* 28(8): 1, 4-5; 1978. (1 reference)

Mirex, chlordecone (Kepone), and hexachloro cyclopentadiene are discussed in this review of the report of a panel on Kepone/ Mirex/ Hexachlorocyclopentadiene. The panel reports that mirex is more resistant to degradation in the environment than other organochlorine compounds, it is metabolized and excreted slowly, it accumulates in biological tissue, and it is capable of producing chronic toxic effects. Chlordecone also degrades slowly and concentrates in biological organisms. The toxic effects of chlordecone were observed in workers at the Kepone plant in Hopewell, VA; these workers showed weight loss, neurological impairment, abnormal liver function, skin rash, and reproductive failure. The use of hexachlorocyclopentadiene has been decreasing in the United States, however, it is still being used in the manufacture of fire retardants and pesticides for export. There is little data available regarding health aspects or its impact on the environment.

78-2269. Anonymous **New trends in rice pest control.** *Pesticides* 11(3): 62-63; 1977.

Recent developments in pest control for rice are reviewed. It is emphasized that use of pesticides in control often has intense ecological implications resulting from modification of the environment. The use of resistant cultivars is an advantageous pest control method because the characteristic is heritable, and therefore, pesticide hazards would be eliminated. Potassium has been shown to provide resistance to plants against certain pests. Biological control, which makes use of bacterial and viral infections, has been effective in controlling certain pests. The need for integrated pest control is emphasized.

78-2270. Furtick, W. R. (Author address not given) **Uncontrolled pests or adequate food?** In: *Pesticides and Human Welfare.* Gunn, D. L. and Stevens, J. G. R., eds. (Oxford: Oxford University Press): pp. 3-12; 1976.

A significant proportion of the world's harvest is destroyed each year before the products reach the human population due to the presence of pests of various kinds. In developing nations the pre-harvest and post-harvest loss of crops is in the 30% range. Even in highly developed agricultural countries these losses are great. They are caused by diverse species of arthropod and vertebrate animals such as insects and rodents; weedy terrestrial and aquatic plants; plant diseases caused by bacteria, fungi, viruses, and microplasm; and plant nematodes. During the foreseeable future pesticides will remain a primary measure for combating such losses. The control of pests by both pesticide and non-pesticide control measures requires a more highly developed infrastructure and better manpower training than is generally true for most other agricultural inputs. Trends in the world production of food are briefly reviewed, with emphasis on the agricultural changes in the growing world. Pesticides are the primary immediate weapon against pest losses, both on growing crops and during transport and storage after harvest. The use of chemical weed control is also a major factor in increased labor efficiency and reduced drudgery. Adequate and proper use of pesticides can be a major control of pest species. There is a need to develop new, more efficient, and safer pesticides, and to find better and safer ways of using those which are currently available.

78-2271. Davidson, G. (Ross Inst. Trop. Hyg., London Sch. Hyg. & Trop. Med., London, England) **Vector-borne diseases and the need to control them.** In: *Pesticides and Human Welfare.* Gunn, D. L. and Stevens, J. G. R., eds. (Oxford: Oxford University Press): pp. 29-41; 1976. (16 references)

Malaria, filariasis, schistosomiasis, trypanosomiasis, onchocerceiasis and other vector-borne diseases are discussed, and some information is given on their control. By far the greatest portion of malaria eradication has been achieved by the use of residual insecticides applied as surface deposits to the internal walls and roots of human habitations. About 40,000 tons of DDT were used annually in public health programs from 1957 to 1972. During this period no major mishap attributable to the toxicity of DDT was recorded among the 200,000 men who sprayed this insecticide. In more than one instance, house-spraying with insecticides, though nearly always primarily directed toward the control of malaria, had also led to a reduction in anopheline-transmitted filariasis. However, insecticidal control of the urban factor, *Culex pipiens fatigans,* presents problems in that the natural tolerance level of this species is much higher and resistance to the organochlorine insecticides is common. Greatest hopes for control of schistosomiasis are placed on molluscicides. These chemicals kill the snail hosts of the trematodes, especially in areas where breeding places are limited and circumscribed. Trypanosomiasis vectors are susceptible to such insecticides as dieldrin, BHC, and DDT. Insecticides are the only really effective means of control for onchocerciasis and some spectacular successes have already been achieved. The best method seems to be ground application of emulsions containing DDT to water upstream from the breeding areas. Water control schemes have contributed to the spread of vector-borne disease in many localities.

78-2272. Schuhmann, G. (Biol. Bundesanstalt, Brauschweig, Germany) **The economic impact of pesticides on advanced countries.** In: *Pesticides and Human Welfare* Gunn, D. L. and Stevens, J. G. R., eds. (Oxford: Oxford University Press): pp. 55-71; 1976. (22 references)

In discussions of the economic impact of pesticides

in developed areas, the cost-benefit relationship must be considered from the viewpoint of both the farmer and the consumer. Direct and indirect costs must be considered. The former are those which are borne by the farm, while others such as investment in research, residue control, and government control of crop protection are among the indirect costs. The chief aim in using pesticides is to prevent crop losses which result from pests, diseases and weed competition on the farm. The farmer must view his use of pesticides as justified by the increased value of his crop. In developed countries it is common for farmers to receive from government services regular reports indicating how, when, and to what degree their crops are endangered by certain pests, and the action to be taken against them. Not only must the cost of the chemicals themselves be considered, but so must the cost of application. Cooperative approaches for collective treatment are one method of keeping the cost of application as low as possible. Pesticides are viewed not only as means of improving agricultural yields, but also as means for increasing and securing the farmer's income. For the consumer and society, pesticides are important in the preservation of food, by controlling insects and other animal pests in stored products. However, in assessing the social benefits of pesticides, one must also consider the costs and risks involved. Possible hazards for human and animal health must be kept in mind.

78-2273. Jacobs, D. E. (Dep. Pathol., Roy. Vet. Coll., Univ. London, London, England) **Pest control in livestock production.** In: *Pesticides and Human Welfare.* Gunn, D. L. and Stevens, J. G. R., eds. (Oxford: Oxford University Press): pp. 103-114; 1976. (12 references)

The diseases occurring in livestock are of primary concern in regard to the destruction of economic productivity in livestock production. An animal health program must not cost more than the potential value of the benefits derived from its implementation. Often disease control objectives must be subordinated to wider agricultural strategies, the degree of compromise depending on the impact of the disease. Adequate food supplies are essential for optimum livestock production. The elimination of weeds can also be significant. In recent years considerable advances have been made in the development of veterinary insecticides, acaricides, molluscicides, anthelmintics, and antiprotozoal agents, so that now at least one effective compound exists for virtually every major pest affecting animal production. The emergence of strains of parasites resistent to the effects of specific chemicals has been recorded.

78-2274. Adam, A. V. (Pestic. Off., FAO, Rome, Italy) **The importance of pesticides in developing countries.** In: *Pesticide and Human Welfare.* Gunn, D. L. and Stevens, J. G. R., eds. (Oxford: Oxford University Press): pp. 115-130; 1976. (12 references)

In developing countries where virtually all pesticides have to be imported at the expense of limited foreign exchange, the cost of pesticide input in relation to other inputs may reach as much as 40%. Accordingly, considerable care is required in selecting the compounds most suitable for local use, keeping cost/benefit factors in mind. Pesticides must be evaluated in terms of their potential usefulness either in protecting food crops or export cash crops. Countries with limited foreign exchange available for pesticide import may give first priority to the protection of their export crops even at the expense of food crops. The relation between actual cost of using a pesticide and the value of increased yield and quality is very complex. Pesticide use in 1973, as reported by 38 developing nations for which data were sufficiently detailed to allow analysis, totalled 160,000 tons in terms of active ingredients: 106,000 tons of insecticides, 49,000 tons of fungicides, and 5,000 tons of herbicides. In 1975 the same countries reported a total use of 202,000 tons. Basic considerations to be studied in pesticide use include the importance of food losses, safety, formulation, pesticide application, persistence, residues, effects on the environment, legislation, and possibilities for integrated control.

78-2275. Busvine, J. R. (London Sch. Hyg. & Trop. Med., London, England) **Pest resistance to pesticides.** In: *Pesticides and Human Welfare.* Gunn, D. L. and Stevens, J. G. R., eds. (Oxford: Oxford University Press): pp. 193-205; 1976. (6 references)

As a result of the introduction on a vast scale of new synthetic insecticides after 1947, the growth in incidence of resistance to insecticides has mounted steadily. Resistant houseflies, lice, fleas, certain culicine mosquitoes, and various agricultural pests has been reported. The resistant strains have developed due to selective survival, after the wide use of insecticide, of certain individuals which happened to possess genes giving them more or less immunity. Thus it became possible to predict the conditions conducive to the development of resistance. Three factors are significant: the frequency at which resistant genes happen to occur in the pristine populations and their effectiveness; the intensity of selection, that is the magnitude of the population exposed to insecticide and the proportion killed; and the number of generations per year. Experience has shown that once resistance to a particular pesticide has been fully developed it has never yet been possible to reverse the process, either by ceasing to use the pesticide or by any other means. The impact of resistance on control of disease vectors and on agricultural and veterinary pests are considered. Resistance has also been noted in fungi to fungicides, in weeds to herbicides, in nematodes to nematicides, in rodents to rodenticides, and in snails to molluscicides.

78-2276. Mellanby, K. (Nat. Environ. Res. Council, London, England) **Pesticides, the environment, and the balance of nature.** In: *Pesticides and Human Welfare.* Gunn, D. L. and Stevens, J. G. R., eds. (Oxford: Oxford University Press): pp. 217-227; 1976. (5 references)

The validity of the concern about environmental pollution and the loss of the balance of nature through the use of pesticides is examined. Pesticides are criticized for having killed harmless or even beneficial species. The use of these

chemicals has also made possible large-scale changes in landscape. Sometimes ill-advised policies have been implemented before their total effect was understood. The harmful side-effects of pesticides offer further room for complaints. In effect a second farming revolution based on petroleum power and agricultural chemicals, has occurred within the short span of 30 yr. The use of some pesticides has allowed species to develop which had not previously been a problem. Sprays were used to destroy moths whose caterpillars damaged buds and fruits, aphids, and other insects in apple orchards. Unfortunately, these insects has been the predators of red spider mites, which then developed as pests in their own right. Cases in which insecticides were used carelessly or wrongly have resulted in serious damage both to the environment and to human and animal life. Spraying of insecticides and herbicides from aircraft is a highly skilled operation, and sufficient care is not always exercised by the operator. Rivers, streams, and lakes have been polluted by careless or irresponsible discharge of pesticide wastes, sometimes with disastrous and long lasting effects. Many investigators have found traces of DDT and other organochlorines in rain, in birds and other animals, in snow, and in fish at sites remote from those where pesticides were deliberately applied.

78-2277. Gunn, D. L. (Author address not given) **Alternatives to chemical pesticides.** In: *Pesticides and Human Welfare.* Gunn, D. L. and Stevens, J. G. R., eds. (Oxford: Oxford University Press): pp. 241-255; 1976. (22 references)

Work is currently being conducted in the area of integrated pest control in which chemicals are used in conjunction with other methods to achieve control over insect pests. Biological control can be used against arthropods and weeds. The control of arthropods by arthropods is a calculated use of insect or mite predators or parasites to control the numbers of insect or mite pests. Biological control agents chosen for weed control are active against a few species. Consequently chemicals are generally used on crops; biological control can be used where a single species of weed has become dominant and troublesome, either in crops because of inherent resistance to herbicides used or on marginal grazing land of too little value to bear the cost of chemicals. The best-known case of biological control of weeds has been the control of several species of prickly pear (*Opuntia*) in Australia. Many kinds of microbes may contribute to natural mortality in insects. The intention in biological control has been to infect some members of a population, hoping that the infection would spread naturally. This has seldom been achieved. Many known viruses attack insects, including nuclear polyhedron virsuses, granulosis viruses and the iridescent viruses of *Tipula* and mosquitoes and nine pox viruses. Genetic control can be achieved through the breeding of plants for resistance. Genetic control of insects directly involves the application of the method to one generation to reduce the population during the next genetation. Methods involve chromosomal or cytoplasmic incompatibility or deliberate production of chromosome translocations. Use of hormones, hormone bioanalogues, and hormone antagonists are also considered.

78-2278. Mulla, M. S. (Dep. Entomol., Univ. California, Riverside, CA 92502) **Evolution of chemical control strategies for mosquitoes. Conventional, novel and natural chemicals.** *Proc. Pap. Annu. Conf. Calif. Mosq. Control Assoc.* 44: 71-77; 1976. (58 references)

Chemical control agents are important in an intergrated management of mosquito populations. Their effectiveness is governed by proper and judicious use combined with source reduction, biotic control agents and legal and preventive measures. Some of the major factors considered in continued research on the development of application of mosquito control chemicals are: biological activity, specificity, acquired resistance, safety, hazards to nontargets, environmental impact, and economics. Early in the program petroleum oils were commonly used. These include special oils, diesel oil, lube oils, FLIT MLO, cresylic acid, and Paris green. During World War II the advent of DDT enhanced the effectiveness of mosquito control programs on a worldwide basis. The high use levels of organochlorine insecticides continued through the early 1960's, with that use being greatly reduced by 1965 and virtually eliminated by 1970. Resistance and biological magnification were two major reasons for seeking replacements. A very large number of promising organophosphates were screened and evaluated against mosquitoes during the next decade. Most of the effective organophosphates showed activity in the range of 2-50 ppb. Malathion, parathion, fenthion, and chlorpyrifos were some of the best known. Carbamates have not displayed a prominent role in California mosquito control. The aliphatic amines provided relatively cheap and available pre-imagocides which can be used in nonagricultural breeding sources. Insect growth regulators, synthetic pyrethroids, and adulticides are considered.

78-2279. Fadeev, Yu. N.; Novozhiliv, K. V. (V. I. Lenin All-Union Acad. Agric. Sci., Moscow, USSR) **Uspekhi v oblasti razrabotki integrivovannogo metada zashchity rastenii. [Advances in the field of integrated method of plant protection.]** *Zh. Vses. Khim Ova* 23(2): 130-135; 1978. (25 references) (Russian)

The efficacy of integrated methods of plant protection is discussed. The system is based upon the ecological approach and provides for the minimization of all negative side-effects of chemicals. This approach reduced the average toxicity of pesticides: the averaged weighted toxicity of pesticides used in the USSR in 1975 comprised approximately 900 mg/kg, compared with 147.5 mg/kg in 1960. Considerable decrease in the toxicity was also achieved for fungicides (10,000 mg/kg in 1975, compared with 100-3000 mg/kg in 1970) anf for seed dressing (1000 mg/kg in 1975, compared with 25-30 mg/kg in 1970). The most promising approach is the use of sex attractant agents (pheromones) which permit an overall rate reduction of insecticide application.

78-2280. Cserhati, T.; Vegh, A.; Dobrovolszky, A. (Res. Inst. Plant Protect., H-1525 Budapest, Hungary) **Study on the factors influencing the decomposition of linuron.** *Acta Phytopathol. Acad. Sci. Hung.* 11(3-4): 325-330; 1976. (28 references)

The decomposition of an herbicide to a biologically inactive compound to avoid accumulation in the soil is an important requirement for herbicides. This study investigates the pH and temperature dependence of the chemical decomposition of linuron to 3,4-dichloro- aniline. It was found that the activation energy of decomposition does not depend on the pH of the system to a great extent. The rate constants of the reaction were lowwest when the pH was neutral, and highest when the pH was far from neutral (pH 4 and 10). The rate constants measured at different pH's showed a very similar temperature dependence.

78-2281. Baker, H. J.; Bertus, A. L.; Courtney, G. F. (Biol. & Chem. Res. Inst. New South Wales Dep. Agric., Rydalmere, NSW 2116, Australia,) **The uptake of some benzimidazole fungicides from soil into plants and their persistence in soil and plant tissue.** *Acta Phytopathol. Acad. Sci. Hung.* 11(3-4): 331-334; 1976. (7 references)

When seedlings of *Agonis flexuosa* Spreng. were 15 cm tall, the soil in each pot was drenched with 250 ml of an aqueous suspension of fungicide containing 750 ppm of active constituent. The fungicides tested included benomyl, carbendazim, or thiabendazole. Samples were taken for analysis at 1, 4, 8, 12, 22, and 36 days after treatment. A second lot of plants were given repeat treatment with fungicide 4 and 8 wk after initial treatments and samples for analysis were taken 4, 8, and 16 wk after the last treatment. Soil treatments with benomyl, carbendazim, or thiabendazole resulted in more rapid uptake by the plants of benomyl and carbendazime than thiabendazole which was apparently adsorbed onto soil particles and taken up more slowly by the plant. This characteristic may make thiabendazole more suitable as a preventative against susceptible foliar pathogens due to the increased retention time.

78-2282. Kecskes, M. (Agric. & Ind. Microbiol. Sect., Hung. Microbiol. Soc., Hung. Acad. Sci., Budapest, Hungary) **Interactions of pesticides and microorganisms.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1-2): 1-2; 1977.

The various biological and environmental interactions of pesticides were examined during the 25th Anniversary Congress held by the Hungarian Academy of Sciences in Budapest, in September, 1976. The number and type of microorganisms, their physiological gropus, and their effects on phytotoxicity of herbicides and pesticides were among the topics of discussion. Pesticide interactions, the degradation of pesticides by biological and chemical methods, and the combined effects of pesticide and fertilizer applictions were also included in the conference. The environmental and biological aspects of pesticide and microorganisms interactions were among major topics of interest.

78-2283. Mareckova, H.; Husarova, M. (Res. Inst. Crop Product., Prague-Ruzyne, CSSR) **Effect of long-term systemic herbicide application on *Rhizobium* survival in soil.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1-2): 19-21; 1977. (8 references)

The influence of long-term treatment of soil by herbicides on the survival of natural populations of nodule bacteria *Rhizobium meliloti* and *Rhizobium trifolii* was examined. Comparisons of untreated soil and treated soil (4 kg of Zeazin (atrazine) and 7kg of Ramrod (propachlor) for 11 yr) populations were made using the Brockwell, or "Indirect Infection" count method. Survival of *R. trifolii* and *R. meliloti* in soil free from a specific host plant were good. The triazine herbicides inhibit the growth of *R. trifolii,* while stimulating the growth of *R. meliloti.* Results indicate continued herbicide application would tend to distort population composition. [At the 1976 Meeting of the Hungarian Academy of Sciences.]

78-2284. Salem, S. H.; Hamed, A. S.; Zohdy, L.; Sahab, A. F. (Fac. Agric., Zagazig Univ., Zagazig, Egypt) **Effect of some pesticides on the nodulation and nitrogen fixation of infected broad bean plants with root rot and wild disease.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1-2): 23-30; 1977. (16 references)

Broad bean plants (*Vicia faba*) infected with root rot and wilt disease were studied in pot experiments to determine the effects of some herbicides and insecticides on nodulation and nitrogen fixation. The insecticides Navacron (monocrotophos) 40% and Dipterex (trichlorfon), the herbicide atrazine 50%, and the fungicide Dithan-A (a carbamate) 40%, and the pathogens *Fusarium oxysporum* and *Rhizoctonia solani* were applied to soils. The two pathogens, Navacron, Dipterex, and atrazine inhibited the nitrogen fixation and nodulations of the plants. The fungicide Dithan A 40 stimulated the symbiotic nitrogen fixation. Because of the degradation of Dithan-A 40, after 30 days the herbicide had no further effect on the plants. [At the 1976 Meeting of the Hungarian Academy of Sciences.]

78-2285. Voets, J. P.; Imas, M.O.A.; Goddeeris, H.; Verstraete, W. (Lab. Gen. & Ind. Microbiol., Univ. Gent, 9000 Gent, Belgium) **The influence of pyrazon, ethofumesate and metamitron on the soil microbiota.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1-2): 31-39; 1977. (8 references)

Dose effect laboratory experiments were used to study the effects of pyrazon (pyrazon plus chlorbufam), ethofumesate, and metamitron on soil microbiota and their activities. Doses ranged from 0 to 20 times the normal field application rate. The number of bacteria, the composition of the soil, microorganism population, the urease, phosphatase and saccharase activity, and the soil respiration and nitrification rate were investigated. The Michaelis-Menten constants for soil phosphatase were determined. In general, the soil microbiota was not significantly damaged by the three herbicides. At field application, the respiration and nitrification rates were temporarily inhibited. The metamitron was found

to stimulate the soil urease activity. Results indicate the herbicides pyrazon, ethofumesate and metamitron are biodegradable. [At the 1976 Meeting of the Hungarian Academy of Sciences.]

78-2286. Helmeczi, B. (Dep. Soil Sci. & Microbiol., Agric. Univ. Debrecen, Debrecen, Hungary) **The effect of herbicides on soil bacteria belonging to certain physiological groups.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1-2): 41-49; 1977. (15 references)

Ten herbicides [Afalon 20EC (linuron), Akticon 90WP, Eptan SH 202, urea Satecide 65 WP, Kartex "A" and "B", propachlor 40 EC, Satecide 65 WP, Sutan 80 EC (butylate), and Terbutrin 50 (terbutryn)] were studied in small plot field experiments to determine their effects on soil bacteria. Four groups of bacteria, aerobic nitrogen-fixing, aerobic cellulose decomposing, nitrifying and ammonifying, were examined. Bacterial counts were done using a modified Pochon's method. Among the herbicides, there was no major inhibition of the four types of bacteria, and occassional stimulation was noted. All the groups of bacteria displayed different behaviors and sensitivities. The most sensitive bacteria was the nitrifying group, while the aerobic cellulose decomposing bacteria were the least sensitive. [At the 1976 Meeting of the Hungarian Academy of Sciences.]

78-2287. Wright, S. J. L.; Stainthorpe, A. F.; Downs, J. D. (Sch. Biol. Sci., Univ. Bath, Bath, England) **Interactions of the herbicide propanil and a metabolite, 3,4-dichloro- aniline, with blue-gree algae.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1-2): 51-60; 1977. (28 references)

The effects of the herbicide propanil on the photoauxotrophic growth of several blue green algae, including common nitrogen-fixing species, were examined. The concentrations examined were below those used for weed control. Sensitivity to propanil was influenced by growth conditions. Low concentrations (less than 0.03 ppm) slightly stimulated some algae, while intermediate concentrations (less than 0.2 ppm) reduced growth in all species and caused cellular abnormalities in some. Concentrations of propanil above 5 ppm stopped photosynthesis and prevented growth. The primary metabolite of propanil, 3,4-dichloro aniline (DCA) was also examined. The DCA was far less inhibitory to algae growth. [At the 1976 Meeting of the Hungarian Academy of Sciences.]

78-2288. Rankov. V.; Valev, B. (Veg. Crops Res. Inst. "Maritsa", Plovdiv, Bulgaria) **Detoxication of the herbicide propachlor by certain microscopic fungi.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1-2): 67-72; 1978. (19 references)

A model experiment was conducted for 120 days to study the participation of ten microscopic fungi from *Penicillium, Aspergillus, Fusarium* and *Trichoderma* in detoxication of the herbicide propachlor. Temperature was maintained at 28°C, and soil humidity at 65%. Alluvial meadow soil was used in nonsterilized, sterilized, and non-sterilized plus 200 ml Czapek's nutrient liquid/1000g soil, and in sterilized plus nutrient medium conditions. The residual herbicide amounts were determined by test culture - brewing barley. The results of this study showed that the microscopic fungi from *Penicillium* (*P. liliacinum, P. ciclopium, P. pupurogenum, P. sclerotiorum*), *Aspergillus* (*A. niger, A. flavus*) and *Trichoderma viride* quickened the degradation and detoxication of the herbicide propachlor, and, on account of this, they participated in its detoxication. [At the 1976 Meeting of the Hungarian Academy of Sciences.]

78-2289. Gombos, M.; Huber, G.; Pfeifer, G.; Kecskes, M. (Res. Inst. Heavy Chem. Ind., Veszprem, Hungary) **Xenobiotics and soil microbiota affected by xenobiotic interactions. V. Decomposition of N-phenyl-phthalamine acid in soils with disinfectants.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1-2): 93-100; 1977. (19 references)

The dosage effects of N-phenyl phthalamine acid on soil microbes were examined for different soil types (blown sand, chernozem with forest residues, "Kotu" soil, and brown forest soil). "High" (0.01 and 0.1%) doses decreased only slightly the total number of microorganisms during the first 2-3 wk. "Huge" doses (1 and 3%) markedly decreased the microbe count, but the inhibition was only temporary (4-6 wk). High and huge doses decomposed differently in the different soils, but 50-75% of the dose of N-phenyl phthalamine was degraded by the end of the first week. Decomposition was faster in the chernozem, while the brown forest and "Koto" soil markedly inhibited the herbicide degradation. [At the 1976 Meeting of the Hungarian Academy of Sciences.]

78-2290. Kecskes, M. (Res. Inst. Soil Sci. & Agric. Chem., Hung. Acad. Sci., Budapest, Hungary.) **Brief statement on Hungarian research on the interactions of pesticides, microorganisms and higher plants.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1-2): 121-131; 1977. (127 references)

A review of Hungarian and other recent literature concerning pesticides, herbicides, and microorganism interactions is presented. Although pesticides have be used since the 1950's, only within the last few years has the interest in pesticide and microorganism interactions become widespread. Short descriptions of important papers are included, and work with specific fungicides, zoocides, pesticides, and herbicides is discussed. [At the 1976 Meeting of the Hungarian Academy of Sciences.]

78-2291. Nakajima, M. (Dep. Agric. Chem., Kyoto Univ., Kyoto, Japan.) **Insecticidal activity and biodegradability of lindane analogues.** *Adv. Environ. Sci. Technol.* 6: 287-294; 1976.

A number of lindane analogs were synthesized in which one or two of the six chlorine atoms were replaced by other substituents such as H, F, Br, I, Me, SMe, or alkoxy. These compounds are broadly classified according to the position of substituents, other than chlorine, as meso-type and dl-type analogs. The median lethal dose values against the

mosquito, housefly, and German cockroach were determined by the topical application method. The synergistic ratios for activity against the mosquito and German cockroach were generally low and showed no significant variation with structural modification. This indicates that the variation in insecticidal activity among the analogs is not critically controlled by the oxidative degradation in these insects. To confirm the structure of possible metabolites, in vitro metabolism experiments were performed using microsomal mfo preparations from susceptible female housefly abdomens.

78-2292. Stefanovits, P.; Tomko, B. (Author address not given) **A Hungazin PK mozgasa a talijban. [Penetration of Hungazin PK in the Soil.]** *Agrartud. Egy. Mezogazdasagtud. Kar* :pp. 269-284; 1976. (18 references) (Hungarian)

The interaction of Hungazin PK (an *S*-triazine compound) with soils was examined using as soil types regosol on loess of Domos, pseudomycelar chernozem, and lowland pseudomycelar chernozem. Differences were found in the penetration of Hungazin PK according to the soil type. Translocation was highest in the soil of Domos and lower in the chernozem soils. These translocation differences probably were due to differences in soil pH or humus and clay mineral content. Increased humus and clay content increased the rate of absorption, and pH affected both the solubility and the adsorption balance of Hungazin PK. It is stressed that the amount of herbicide translocated in the soil with precipitation depends on soil type, soil properties, dose applied, and amount of precipitation; for optimal efficiency, the herbicide should remain in the upper soil layers without moving to deeper layers, and there should be no harmful residues remaining after the growing season.

78-2293. Leistra, M. (Lab. Res. Insecticides, Wageningen, The Netherlands) **A model for the transport of pesticides in soil with diffusion-controlled rates of adsorption and desorption.** *Agric. Environ.* 3(4): 325-335; 1977. (13 references)

A computation model was used to simulate the downward movement of a pesticide in soil brought about by different rainfall patterns. The movement occurred in the mobile region of a hypothetical soil system by convention together with hydrodynamic dispersion, and by diffusion. Diffusion into and out of a soil region with a stagnant liquid phase caused lateral transport. Lateral diffusion distances of a few mm or more caused substantial deviation from the concentration-depth relationship for equilibrium adsorption with 40 mm of rainfall in 2 days. When 40 mm of rainfall was scattered over a 20 day period, lateral diffusion distances up to a few mm had little effect, but those of about 10 mm or more had a very strong influence. An extremely important factor in this study was the initial condition near the soil surface. When the pesticide was initially present in the mobile region, overall mobility was comparatively great. Mobility was much lower than with instantaneous adsorption and desorption, when the initial condition was equilibrium between the mobile and stagnant regions near the surface of the soil.

78-2294. Smelt, J. H.; Houx, N. W. H.; Lexmond, T. M.; Nollen, H. M. (Lab. Res. Insecticides, Wageningen, The Netherlands) **Residues of aldicarb and its oxidation products in potato tubers after field application.** *Agric. Environ.* 3(4): 337-347; 1977. (15 references)

To determine the residue levels of aldicarb and its breakdown products sulphoxide and sulphone in potatoes, field trials were conducted in the potato-growing areas of the Netherlands. A 10% granular formulation of aldicarb was spread on the soil by hand and incorporated 10-15 cm into the soil by rotatillage. Fifty-one samples were taken, and residues ranged from 0.02 to 0.77 mg/kg. Residues of aldicarb were not found in either of the two years studied, however, sulphoxide comprised 70-75% of the total toxic residue in 1974, and 42-76% of the total residue in 1975. These results support earlier findings that the concentration of aldicarb in the soil declines rapidly after application. Weather conditions, cooking, and storage most likely affect residue levels.

78-2295. Smolik, J. (Inst. Potato Res. & Improvement, Havlickuv Brod, Czechoslovakia) **Indikace pritomnosti herbicidu bramborovymi klicky. [Indication of the presence of herbicides in potato hypocotyls.]** *Agrochemia* 18(5): 137-140; 1978. (5 references) (Czech)

Results of field tests in which a bioassay method was applied using hypocotyls of potatoes of the Radka variety and spring barley as test plants to determine (by their growth rate impairment) the presence in the soil of residues of the herbicides Roundup (glyphosate) and TCA (trichloroacetic acid) which could harm subsequent plant cultures are evaluated. The effects were determined 10 to 40 days following the application of the herbicides. In the case of Roundup, soil samples taken 30 days following application from the depth of 8 cm exhibited no residual activity thus confirming that Roundup is safe in this respect. In the case of TCA soil samples taken from depths of 8-16 cm 10, 20, and 30 days following application caused all barley hypocotyls to die within 30 days; potato hypocotyls were more tolerant to the herbicide. These latter results indicate that TCA should be applied only in the fall to give its residue time to decompose over the winter. Spring barley is a suitable test plant for the above purpose; potatoes are unsuitable because of their great recuperating power and supply of nutrients. Potato hypocotyls may serve as test plants for the determination of selectivity for potatoes.

78-2296. Sanchez Camazano, M.; Sanchez Martin, M. J. (Cent. Edafol. & Biol. Apl. Salamanca, Salamanca, Spain) **Interaccion entre pesticidas organofosforados y mineralos de la arcilla. I. [Interaction between organophosphorus pesticides and clay minerals. I. Adsorption of O-O dimethyl, O-2.2 dichlorovinyl phosphate (dichlorvos) by montmorillonite.]** *An. Edafol. Agrobiol.* 36(7-8): 725-737; 1977. (18 references) (Spanish)

The interaction between montmorillonite and dichlorvos was studied. The insecticide is adsorbed by montmorillonite; it penetrates into the interlayer space and causes

swelling of the silicate, forming definite complexes with spacing between 2.52 nm and 2.94 nm. The drying of these complexes at room temperature or under vacuum produces a more stable phase, with $d(001) = 1.98$ nm. The adsorption is related to the layer charge and water content of the silicate, the concentration of the pesticide, the contact time and the nature of the exchangeable cations. Infrared absorption spectroscopy showed that the dichlorvos molecules are bonded to the exchangeable cations through the oxygen of the phosphoryl group. From the above results and based on the molecular structure, it concluded that the adsorption corresponds to 2, 3, or 4 layers of dichlorvos in the interlayer space.

78-2297. Kaufman, D. D. (Pestic. Degradation Lab., Agric. Environ. Qual. Inst., ARS, USDA, Beltsville, MD) **Soil-fungicide interactions.** In: *Antifungal Compounds.* Siegel, M. R., Sisler, H. D., eds. (New York: Marcel Dekker, Inc.): Chapt. 1: 1-49; 1977. (331 references)

Fungicides enter into the soil by direct or indirect application. The behavior of a fungicide depends on the physical, chemical and biological properties of both the soil and the pesticide. The interactions of several processes also help to determine the effectiveness of the fungicides. These interactions include sorbtion, volatilization, diffusion, leaching, runoff, microbial and chemical degradation, plant uptake and photodegradation. The effect of these parameters are examined individually and collectively to determine the importance of the various processes. A brief discussion of the investigative methods for soil fungicide behavior is included. The effect of fungicides on soil microorganisms is examined in detail.

78-2298. Kaars Sijpesteijn, A.; Dekhuijzen, H. M.; Vonk, J. W. (Inst. Org. Chem., TNO, Cent. Organ. Appl. Sci. Res. Netherlands, Utrecht, The Netherlands.) **Biological conversion of fungicides in plants and microorganisms.** In: *Antifungal Compounds.* Siegel, M. R., Sisler, H. D., eds. (New York: Marcel Dekker, Inc.): Chapt. 3: 91-147; 1977. (246 references)

Knowledge of paths of fungicide breakdown by plants and microorganisms is poor. Chemical conversions often cannot be separated from biological conversions. Biological conversions can occur if enzyme specificity is wide enough to accept such compounds. The plant or microorganism may convert fungicides to breakdown products, with or without utilization of the carbon and energy. Biological conversions occur as oxidation, reduction, conjugate formation or hydrolysis reactions. Plant and microorganism breakdown paths, by-products for the fungicides of the dithiocarbamate group, the trichloromethylsulfenyl group, benzimidazole derivatives, dinocap, substituted benzanilides, organic phosphate esters, polychlorinated aromatics and organometallic compounds are examined in detail.

78-2299. Woodcock, D. (Dep. Agric. Horticult., Long Ashton Res. Stn., Univ. Bristol, Bristol, England) **Nonbiological conversions of fungicides.** In: *Antifungal Compounds.* Siegel, M. R., Sisler, H. D., eds. (New York: Marcel Dekker, Inc.): Chapt. 5: 209-249; 1977. (137 references)

Both chemical and biological degradation of fungicides take place in the soil, although there is great difficulty in differentiating between the two processes. Soil provides an ideal environment for degradation of fungicides. Chemical breakdown entails a variety of reactions, such as hydrolysis, oxidation, epoxidation, dimerization and polymerization. All these processes may be photopromoted and probably photoinitiated by ultraviolet radiation. The breakdown and degradation products of soil fungicides and seed sterilants (such as organomercurial, organosulfur, and aromatic compounds), protectant fungicides (including organotin compounds, quinones, and aromatic and heterocyclic compounds) and the systemic fungicides (such as heterocyclic and aromatic compounds and antibiotics) are examined in detail.

78-2300. Brooker, M. P. (Dep. Appl. Biol., Univ. Cambridge, Cambridge, England) **The ecological effects of the use of dalapon and 2,4-D for drainage channel management.** *Arch. Hydrobiol.* 78(3): 396-412; 1976. (45 references)

A field experiment designed to compare the ecological effects of the use of dalapon and 2,4-D and the conventional method of hand clearing for drainage channel maintenance is described. Dalapon was applied to the experimental area at a rate of 25 kg AI/ha in September 1973, and a mixture of dalapon at 12 kg AI/ha, and 2,4-D at 1 kg AI/ha was applied to the area the following spring. Macrophytes, algae and herbicides in the water were examined and measured, and chemical analyses of the water were made. The autumn application of dalapon controlled the growth of *Phragmites communis* and the spring application mixture restricted ditchbank vegetation. Peak concentrations in the experimental area were 117 μg/l for dalapon, and 29 μg/l for 2,4-D. The peak biomass of *P. communis* was 820 g (dry wt)/m^2 before herbicide application, and 54 (dry wt)/m^2 after application.

78-2301. Maggi, E.; Campanini, G.; Dazzi, G.; Madarena, G. (Ist. Policattedra Ispez. Aliment. Orig. Anim., Univ. Parma, Parma, Italy) **Determinazione dei pesticidi cloro-organici in prodotti carnei inscatolati. [Investigation of the organochlorine pesticide residues in canned meat.]** *Arch. Vet. Ital.* 28(5-6): 164-166; 1977. (20 references) (Italian)

Sixty samples of domestic and imported commercial beef products canned in 1974 and 1975 were analyzed by gas chromatography for their content of organochlorine residues (BHC, heptachlor, aldrin, dieldrin, DDE, TDE, and DDT). Homogenized samples were extracted with hexane, purified, subjected to gas chromatography and evaluated by comparison with standard solutions of known quantities of the respective pesticides. The median levels of residues found (α-BHC 4.8 ppb, *p,p'*-DDT 5.4 ppb) in all cases were below the maximum permissible levels. On the whole a uniform level of contamination was found, with smoked tongue on the high side and roast beef on the low side, which is explained by the

different fat contents of the various meats. Fresh and frozen beef samples contained lower levels of organochlorine pesticides than canned beef, where the levels were invariably related to the fat content. DDT metabolites found in canned meat seem to indicate some decomposition as a result of cooking during canning.

78-2302. Baluja, G.; Hernandez, L. M. (Inst. Quim. Organ., Madrid 6, Spain) **Organochlorine pesticide and PCB residues in wild bird eggs from the South-West of Spain.** *Bull. Environ. Contam. Toxicol.* 19(6): 655-664; 1978. (10 references)

New data on the levels of organochlorine pesticides and PCB residues in eggs of birds from the South-West of Spain are presented. These studies were conducted to evaluate possible effects of organochlorine residues on wild birds living in the Donana Reserve, whose populations appear to be declining. Aldrin, dieldrin, *o,p'*-DDT, heptachlor, and heptachlor epoxide were detected as trace amounts in most eggs collected in 1972 and 1973. Heptachlor epoxide and dieldrin occurred more frequently in eggs collected in 1975 and 1976 at levels ranging from 0.001 ppm to 0.426 ppm, with the highest levels in eagle eggs. DDE, TDE, and DDT were easily detected in all eggs. DDE ranged from 0.100 ppm to 9.202 ppm, and total DDT group ranged from 0.157 ppm to 9.917 ppm, the highest levels found in Black Kite and Imperial Eagle eggs sampled in 1976. Higher PCB residues were found in Imperial Eagle eggs with a range between 0.599 ppm and 7.742 ppm, but the highest PCB level (9.071) was found in one Little Tern egg collected in 1973. Residue levels appear superimposable from phytophagous to predatory species. Pesticides and other pollutants enter the Reserve either by aerial transport or via drainage water, as the water system of the area forms a more or less closed circuit with the Guadalquivir river, which is polluted at low levels. Pesticides are also applied by aerial spraying on rice and olive-planted areas not far from the Reserve.

78-2303. de Barros, M. C. (Lab. Fitofarmacol., Quinta do Marques, Oeiras, Portugal) **Organochlorine insecticide residues in red-legged partridge.** *Bull. Environ. Contam. Toxicol.* 19(6): 697-702; 1978. (4 references)

Organochlorine residues in red-legged partidges were determined in order to assess the importance of this factor for the preservation and expansion of the species. Between November 1971 and January 1972 86 partridges were shot in 19 districts in 9 provinces of Portugal. Residues found included HCB (hexachlorobenzene), dieldrin, DDE, TDE, DDT, and *o,p'*-DDT. Contamination of this species by DDT and its metabolites occurs at low levels, since DDE residues exceeding 0.01 mg/kg were found in only 6% of the samples, TDE in 1%, and *p,p'*-DDT in 6%. PCB's were not detected in any samples up to the 0.01 mg/kg level of sensitivity. Dieldrin residues were rarely detected. Residues of HCB were found in samples collected in Baixo Alentejo at levels exceeding 0.01 mg/kg in 36% of the birds, while in 12% residues exceeded 0.1 mg/kg. The low residue levels detected in these samples clearly reflect the eating habits of these birds. It is concluded that local contamination of the red-legged partridge from both DDT and HCB exists in the Alentejo region in contrast with a low contamination level in the other regions of Portugal.

78-2304. Moody, R. P.; Prasad, R.; Greenhalgh, R. J.; Weinberger, P. (Canada Dep. Environ., Ottawa, Ont., Canada) **Fate of fenitrothion in forest trees. VII. Persistence, translocation and metabolism of ^{14}C-fenitrothion in conifers.** *Chem. Control Res. Inst. Ottawa Inf. Rep. CC-X* 122 (Sept.): 40 p.; 1976. (10 references)

The persistence, translocation, and metabolism of fenitrothion in conifers was studied by applying ^{14}C-labeled fenitrothion to 4-yr-old seedlings of balsam fir, white spruce, and Jack pine in the greenhouse. Results showed that 60-70% of the applied fenitrothion has been lost one day after treatment, probably due to volatilization. There was a direct relationship between the amount of pesticide absorbed and the amount persisting in the tissue. Fenitrothion was found to be translocated acropetally into the young foliage of fir, a process which took place via the xylem vessels. These results indicate that fenitrothion is able to work systematically and may therefore be useful in budworm control.

78-2305. Fuchsbichler, G.; Suess, A. (Bayer. Landesanst. Bodenkult. & Pflanzenbau, D-8000 Munich 19, Germany) **Desorption und Austausch von sorbiertem 4-Chloranilin. [Desorption and exchange of sorbed 4-chloraniline.]** *Chemosphere* 7(4): 345-350; 1978. (7 references) (German)

Quantities of 4-chloroaniline (produced in soil by the degradation of urea-based herbicides) sorbed, desorbed, and exchanged under selected reaction conditions were determined in 8 different agricultural soils. In preliminary tests it was determined that only 4-chloroaniline and 3,4-dichloroaniline are capable of displacing sorbed 4-chloroaniline from soil, while monolinuron, atrazine, pyrazon, citric acid, 4-aminobenzoic acid, and potassium, aluminum, and calcium chloride are not. Desorption rates of the adsorbed 4-chloroaniline into water ranged from 11.9% to 68.3%, and the percentage of residual sorbed 4-chloraniline which could be replaced by 3,4-dichloroaniline varied from 17.9% to 100%. Prolonged residence of 4-chloroaniline in the soil resulted in chemical bonding of the compound so that it could no longer be separated from the soil components. The use of 3,4-dichloroaniline as an exchanger for 4-chloroaniline provides an indication of the quantity of 4-chloroaniline which is weakly sorbed in the soil, in contrast to the firmly bound fraction. Specific exchangers may also exist for other biocides and their metabolites which would permit this type of evaluation to be made.

78-2306. Gebefuegi, I.; Michna, A.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen & Umweltforsch mbH, D-8051 Attaching, Germany) **Beitraege zur oekologischen Chemie CXLIV. Zur oekologisch- chemischen Bewertung**

des Pentachlorophenols in geschlossenen Raeumen. [Contributions to ecological chemistry. 144. Ecological- chemical evaluation of pentachlorophenol in confined areas.] *Chemosphere* 7(4): 359-364; 1978. (6 references) (German)

Wood treated with PCP as a preservative releases PCP into air; this can then be transported to and deposited on other articles present in the room with the treated object. The effect of the relative humidity on this process was investigated by determining PCP levels in air above an indoor swimming pool, wherein the walls of the pool enclosure were paneled with PCP-treated wood. The water content of the air *per se* did not provide a reliable predictive factor for the PCP concentration in air. The direction of diffusion of water vapor at the wood surface was the actual determiner of PCP release. However, for practical purposes a correlation can be assumed between PCP concentration and humidity as well as air temperature. In a related experiment the total PCP release by the wood paneling was estimated. The pool hall was aired out, the pool was refilled, and the PCP concentrations was determined after 14 days under normal conditions. The concentration of PCP in the pool water was 1 μg/l, in the dehumidifier condensate 60 μg/l, and in the air in the hall 4 μg/m³.

78-2307. McDermott-Ehrlich, D.; Young, D. R.; Heesen, T. C. (Lockhead Cent. Mar. Res., Carlsbad, CA 92008) **DDT and PCB and flatfish around Southern California municipal outfalls.** *Chemosphere* 7(6): 453-461; 1978. (18 references)

The distribution of DDT and polychlorinated biphenyl residues near 5 major municipal outfall systems in Southern California and a coastal and an island site were studied using Dover sole, *Microstomus pacificus*, as a bioindicator. The seven sites studied were Oxnard, Santa Monica, Palos Verdes, Orange County (north of Newport Beach), Dana Point, San Diego (Point Loma), and Santa Catalina Island. Even though major input of DDT and polychlorinated biphenyls had decreased during the years 1971 to 1975, fish collected in 1974-1975 showed no decline in muscle tissue concentrations of the two compounds. Decreases in the upper limits of DDT concentrations were noted at Palos Verdes and Santa Monica, the two most contaminated areas. Orange County and Dana Point showed increases in the upper limit of total DDT levels, indicating migration of the fish may have taken place. Changes in total polychlorinated biphenyls were similar to those for total DDT. Fish from Palos Verdes showed high chlorinated hydrocarbon liver-to- muscle tissue burden ratios when compared with fish from other areas.

78-2308. Vannucchi, C.; Sivieri, S.; Ceccanti, M. (Lab. Public Health Prov. Pisa, Pisa, Italy) **Residues of chlorinated naphthalenes, other hydrocarbons, and toxic metals (Hg, Pb, Cd) in tissues of Mediterranean seagulls.** *Chemosphere* 7(6): 483-490; 1978. (19 references)

To provide more data relating to the widespread occurrence of chlorinated hydrocarbons and toxic metals which accumulate in the tissues of marine birds, samples were collected from five Meditteranean seagulls and analyzed to determine the levels of chlorinated insecticides, polychlorinated biphenyls, PCT's, PCN's and the heavy metals, mercury, lead and cadmium. Each analyzed sample showed residues of the DDT and PCB groups; *p,p'*-DDE was found in all samples at higher levels than DDT. Lindane, heptachlor epoxide, and dieldrin were found in many tissues, but no heptachlor, aldrin, or endrin was found. Four birds had PCT residues; these same birds also had high PCB residues. PCN's were present in two liver samples. Heavy metals were found in all samples; lead had the highest concentration, followed by mercury and cadmium.

78-2309. Sriharan, S.; Suess, A. (Nucl. Res. Lab., Indian Agric. Res. Inst., New Delhi 110012, India) **Studies on the distribution of fenthion in plants and soil ecosystems.** *Chemosphere* 7(6): 509-515; 1978. (10 references)

Studies were conducted using fenthion to monitor pesticide residues in plants and soil. Wheat and bean plants were grown in humus (loamy clay) and standard (silty loam) soils and treated with 2 mg of ^{14}C-labeled fenthion. The ^{14}C activity in wheat 4 wk after treatment ranged from 0.173 ppm to 0.200 ppm in humus and standard soils, respectively and in beans from 0.056 ppm to 0.570 ppm in humus and standard soils. ^{14}C activity was high in humus (89-91%), but in standard soil it was 78-80%. Solvent extractable ^{14}C activity was greater when the soil was wetted with water.

78-2310. Kudrev, T. G.; Kamenova-Yuhimenko, S. M.; Apostolova-Shahpazova, L. K.; Gounchev, H. Z.; Evtimov, I. E. (Bulgarian Acad. Sci., Sophia, Bulgaria) **Residual amounts of mercury in tomato plants as a result of the pre-sowing treatment of the seeds with Falizan.** *C. R. Acad. Bulg. Sci.* 30(11): 1621-1623; 1977. (3 references)

Experiments were undertaken to determine the amount of mercury in tomato plants whose seeds had been treated with the organo-mercury preparation Falizan, which works against *Corynebacterium michiganense*. The seeds were soaked for one hour in 0.25% Falizan (1500 ppm mercury) prior to sowing. Treated seeds were found to contain 860 ppm mercury, seeds from 4-day shoots contained 700 ppm, and roots of 4-day shoots contained 100 ppm mercury. Six days after thinning out, the stems contained 180 ppm mercury, and the leaves contained only traces of mercury. At the phase of large-scale fruition and ripening of the first cluster of fruit, the roots contained 11 ppm mercury, the stems contained traces, the leaves contained 22 ppm mercury, and the fruits contained no mercury. The absense of mercury in the fruit and seeds of ripe tomatoes indicates that the leaves protect the fruit at this later stage of development.

78-2311. Gaviria, A.; Echeverri, O. I. (Lab. Fac. Ing. Quim., Univ. Pontifi. Bolivar., Bolivar, Columbia) **El mal uso de los insecticidas. [Abust of insecticides.]** *Contam. Ambiental* 1(2): 22-26; 1977. (5 references) (Spanish)

The general ecological and hygienic problems of the use of insecticides are reviewed. Organochlorine pesticides, such as DDT, aldrin, chlordane, dieldrin, endrin and heptachlor, are highly persistent in the environment, and they tend

to accumulate considerably in the trophic chains. Organophosphorus preparations disappear from the soil in a few weeks, but they may destroy the natural enemies of the pests as well. In view of these circumstances, biological pest control methods are increasingly promising.

78-2312. Madrigal, J. A. C. (Fac. Cienc., Univ. Nac. Sede Medellin, Medellin, Columbia) **Consideraciones generales sobre el uso de pesticidas. [General considerations on pesticide use.]** *Contam. Ambiental* 2(3): 27-43; 1978. (12 references) (Spanish)

The general mechanisms and environmental and hygienic side effects of pesticides are reviewed. The elimination of pollinating insects, contamination of food, soil, water and air, as well as possible teratogenic, mutagenic and carcinogenic effects are the major consequences of the use of pesticides. Organochlorine pesticides are characterized by high persistence in soil; the half-life periods are 10 yr for DDT, 8 yr for dieldrin, 6.5 yr for lindane, 3 yr for aldrin, 4 yr for chlordane and 3.5 yr for heptachlor. The analysis of tomatoes grown in Columbia revealed that the maximum permissible levels were exceeded in 76.5% of the samples for maneb, in 37.93% for EPN and in 100% of the samples for endrin. The median residue levels were 27.9 ppm for maneb, 2.2 ppm for EPN and 0.39 ppm for endrin.

78-2313. Hobart, J. (Dep. Appl. Zool., Univ. Coll. North Wales, Bangor, Wales) **Pesticides in forestry: an introduction.** In: *Ecological Effects of Pesticides.* Perring, F. H.; Mellanby, K., eds. (New York: Academic Press): 61-88; 1977. (60 references)

The application of pesticides in forestry involves the use of traditional agricultural or horticultural methods of applying pesticides. After trees have been planted in the forest, pesticides are applied, usually in spray form, from the air. The short term effects of pesticides applied from the air are diagrammed and described. Spray drift, which can result in contamination, is described, and the need for adequate 'leave' strips along rivers, streams, human habitations, and farmlands is emphasized. Nursery pests and the insecticides or acaricides used to treat them are summarized.

78-2314. Hashemy-Tonkabony, S. E.; Soleimani-Amiri, M. J. (Lab. Toxicol., Dep. Food Hyg., Univ. Tehran, Tehran, Iran) **Chlorinated pesticide residues in the body fat of people in Iran.** *Environ. Res.* 16(1-3): 419-422; 1978. (12 references)

Storage levels of dieldrin, benzene hexachloride (BHC) and DDT and its metabolites were determined in the adipose tissues of 170 autopsy cases 4-91 yr old during September, 1974 through November, 1976 to assess the health hazards of the use of chlorinated pesticides in Iran. Moderate levels of DDT and BHC were found (means of 2.64 and 0.26 ppm, respectively), and relatively low levels of aldrin/dieldrin were found (mean of 0.049 ppm). High concentrations of DDD (TDE, mean of 0.232 ppm) found were considered possibly due to an intermediate dechlorination product formed in the conversion of DDT to DDA or some change occurring after death, possibly anaerobic metabolism by microorganisms. The concentrations of pesticide residues were slightly higher in females than in males. Higher levels of dieldrin and DDT and its metabolites were found in the 60-70-yr age group.

78-2315. Priebe, K. (Staatl. Veterinaeramt, D-2850 Bremerhaven, Germany) **Der DDT-Gehalt in der Muskulatur von nordostatlantischen Meeresfischen mit hoher Lebenserwartung unter Beruecksihtigung des Quecksilbergehaltes. [The DDT-content of the musculature of north-east Atlantic fish with a high expectation of life as related to the mercury content.]** *Fleischwirtschaft* 58(1): 76-77, 147-150; 1978. (11 references) (German)

Because substances such as mercury and DDT derivatives are hard to break down or excrete, they accumulate in animals in areas of contamination; for this reason, the examination of old fish is a good technique for determining whether an area has been exposed to DDT contamination, and for how long. The amounts of total DDT and mercury in the musculature of halibut (*Hippoglossus hippoglossus*), and sharks (*Somniosus microcephalus* and *Lamna nasus*) were determined. These fish are known to reach advanced age. Results showed that fish with higher body weight and thus, older, fish tended to have higher contents of total DDT. Thirty fish were examined; only one had more than 2.0 ppm DDT, which is the limit specified by the German DDT maximum quantities regulations for fish.

78-2316. Sastry, M. S.; Singh, Y. P. (Div. Pharmacol. Toxicol., Indian Vet. Res. Inst., Izatnagar, India) **Monitoring of DDT residue in livestock products.** *Indian J. Med. Res.* 67:462-466; 1978. (12 references)

DDT residue in the edible tissues of sheep has been evaluated by feeding two different levels of DDT over a prolonged period. Concentratons of DDT used were 300 and 1000 ppm incorporated in a concentrate mixture. This mixture was fed over a period of 23 and 14 wk, respectively. Animals were sacrificed at the end of each period and others at 4 wk after cessation of DDT feeding. Edible tissues such as meat, liver, and fat at the end of the feeding trial on 300 and 1000 ppm diet contained 1.67, 0.28, 18.86, and 2.23, 0.21, 27.7, ppm DDT respectively. Controls on the basal ration contained 0.38, 0.25, and 7.2 ppm DDT, respectively. The residues in the edible tissues such as meat and liver were depleted by 4 wk after the discontinuation of DDT feeding, while the fat material constituted a toxic hazard at feeding levels beyond 300 ppm. It is noted that various animal feeds and fodders contain 0.08 to 0.45 ppm DDT, and therefore the residues in the livestock products from these sources would be normally below tolerance limits.

78-2317. El Beit, I. O. D.; Wheelock, J. V.; Cotton, D. E. (Sch. Biol. Sci., Univ., Bradford, West Yorkshire BD7 1DP, England) **Factors affecting the accumulation of dimethoate**

in soil. *Int. J. Environ. Stud.* 11(3): 187-196; 1977. (6 references)

The accumulation of dimethoate in soils was studied with regard to the frequency of application, initial soil moisture content, rate of water application and soil organic matter contents. The soils studied included sandy, sandy clay loam, loam, clay loam and clay. Residual accumulation of the pesticide increased with frequency of application, even under leaching conditions. Loam soil showed the highest retention of dimethoate. The clay loam and the clay gave a lower value for retention than the loam, possibly due to pesticide degradation because of the alkaline conditions. Increasing the initial soil moisture content resulted in increased loss by leaching and therefore a reduction in the proportion of pesticide retained in the soil. Increased frequency of water application increased the loss of pesticide from the soil. Removal of soil organic matter reduced the biological degradation of the pesticide but accelerated the loss by leaching, evaporation or co-distillation so that retention was reduced. Measures based on the above results are suggested for maximizing pest control and minimizing the accumulation of dimethoate in soils.

78-2318. Akram, M.; Ahmad, S.; Forgash, A. J.* (Dep. Entomol. & Econ. Zool., Cook Coll., Rutgers State Univ., New Brunswick, NJ 08903) **Metabolism of phosphorothioic acid, *O,O*-dimethyl- *O*-(6-ethoxy- 2-ethyl-4- pyrimidinyl) ester (etrimfos), in bean and corn plants.** *J. Agric. Food Chem.* 26(4): 925-931; 1978. (6 references)

The organothionophosphate etrimfos [phosphorothioic acid, *O,O*-dimethyl-*O*- (6-ethoxy-2-ethyl-4-pyrimidinyl) ester] volatilized rapidly from treated primary leaves of bean and corn seedlings. Twenty-one days after treatment with [^{14}C]etrimfos, 36.4 and 29.5% of the total applied radioactivity was recovered from bean and corn seedlings, respectively. Intact etrimfos was by far the principal compound recovered, followed by small amounts of EEHP (6-ethoxy-2-ethyl-4-pyrimidinol) and EDHP (2-ethyl-4,6- pyrimidinediol). Small amounts of the P:O analogue [phosphoric acid, dimethyl *O*-(6-ethoxy-2- ethyl-4- pyrimidinyl) ester] were also present in corn but not in bean leaves. Four additional products were also detected in small quantities in both plants but were not identified. (Author abstract reprinted by permission of the American Chemical Society)

78-2319. Kan, C. A.; Jonker-den Rooyen, J. C. (Spelderholt Inst. Poult. Res., Minist. Agric. & Fisheries, Beekbergen, The Netherlands) **Accumulation and depletion of some organochlorine pesticides in high-producing laying hens.** *J. Agric. Food Chem.* 26(4): 935-940; 1978. (24 references)

Addition of low concentrations of organochlorine pesticides to the feed of high-producing laying hens for 16 wk had no influence on feed consumption, body weight, egg production, egg weight, and deformation of the egg. Accumulation ratios (concentration of the pesticide in the egg or fat to its concentration in feed) on fat basis were: hexachlorobenzene in egg 11, fat 13; α-hexachlorocyclohexane (α-BHC) in egg 2, fat 2; β-hexachlorocyclohexane (β-BHC) in egg 5, fat 7; DDT (total) in egg 10, fat 12, and dieldrin in egg 11, fat 14. Up to 80% of the pesticides ingested were excreted via eggs and feces. Half-value times of depletion of residues (with uncontaminated feed for 12 wk) were 1.5-2 wk for α- and γ -BHC. The other pesticides have half-value times of about 6-8 wk. Correlations between concentrations of pesticides in abdominal fat and in egg fat within hens are generally very high ($r > +0.9$). The same holds for correlations between concentrations in abdominal fat and fat of the thigh muscle, breast muscle, liver and egg. (Author abstract reprinted by permission of the American Chemical Society)

78-2320. Holmstead, R. L.; Fullmer, D. G.; Ruzo, L. O. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Pyrethroid photodecomposition: Pydrin.** *J. Agric. Food Chem.* 26(4): 954-959; 1978. (16 references)

Photolysis of α-cyano-3-phenoxybenzyl- α-(4-chlorophenyl) isovalerate (Pydrin, fenvalerate) in various solvents (hexane, methanol, acetonitrile: water) by artifical light ($\lambda >$ 290 nm) had as a thin film on glass or on cotton by exposure to sunlight yields products resulting from ester cleavage. The major product in solution is formed via photoinduced decarboxylation. The formation of other photoproducts may be rationalized by a mechanism involving free-radical intermediates. 3-Phenoxybenzoyl cyanide and 3-phenoxybenzyl cyanide, two photoproducts observed in solution but not in sunlight, have ip LD50s to mice of 22 and 105 mg/kg, respectively, and are considerably more toxic than pydrin (LD50 > 500 mg/kg). (Author abstract reprinted by permission of the American Chemical Society)

78-2321. Smith, C. A.; Iwata, Y.; Gunther, F. A. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Conversion and disappearance of methidathion on thin layers of dry soil.** *J. Agric. Food Chem.* 26(4): 959-962; 1978. (12 references)

A technique has been developed for the production of reproducible thin layers of pesticide-containing soil for studies involving residue behavior on air-dry soil under different environmental conditions. The method has been applied to the study of methidathion on six different soils under conditions simulating those occurring on arid land soil surfaces and under abnormally high ozone levels in air. In contrast to results found for methidathion in moist soils, a very slow rate of disappearance occurs in dry soils in the absence of atmospheric oxidants or sunlight. The initial disappearance of methidathion appears to follow first-order kinetics, but with wide rate variations (t 0.5 = 19 to 110 days for the particular types of soils tested). Considerable quantities of methidathion oxygen analogue are produced and retained in dry soil, in contrast to very low amounts found by others for moist soil. (Author abstract reprinted by permission of the American Chemical Society)

78-2322. Parlar, H.; Mansour, M. (Inst. Okol. Chem., Gesellschaft Strahlen. & Umweltforsch. Munchen, D-8051 At-

taching, Germany) **On the sensitized photoisomerization reaction of the insecticide β-dihydroheptachlor.** *J. Agric. Food Chem.* 26(4): 984-986; 1978. (11 references)

Photoisomerization reactions of the cyclodiene insecticide β-dihydroheptachlor (1) were studied in the presence of different sensitizers. With the help of column chromatography two new isomerization products (3 and 4) were isolated and identified by spectroscopic methods (MS, IR, and ^{1}H-NMR). It was found that β-dihydroheptachlor (1) is unstable toward UV light with wavelengths above 290 nm, which predominate in the troposphere. (Author abstract reprinted by permission of the American Chemical Society)

78-2323. Doyle, R. C.; Kaufman, D. D.; Burt, G. W. (Agron. Dep., Univ. Maryland, College Park, MD 20142) **Effect of dairy manure and sewage sludge on ^{14}C-pesticide degradation in soil.** *J. Agric. Food Chem.* 26(4): 987-989; 1978. (3 references)

The degradation of 14 ^{14}C-pesticides in sewage sludge and dairy manure amended Matapeake silt loam was investigated. The dairy manure and sewage sludge (60% primary-40% secondary) were applied at rates of 0, 50, and 100 ton/ha, leached to remove excess soluble salts, and incubated (30°C) for 2 wk prior to application of ^{14}C-pesticides. The pesticides were selected as representative of the major pesticide degradation pathways in soil. Total CO_2 and $^{14}CO_2$ evolution were monitored regularly throughout the 60-day incubation period, and ^{14}C-product distribution was determined by soil extraction and thin-layer chromatographic analysis at the end of the incubation period. Altered rates of pesticide degradation were observed in sludge and/or manure amended soils for a number of structurally unrelated pesticides. ^{14}C-product distribution varied with soil amendments. The degradation of pesticides metabolized by dealkylation reactions (e.g., *s*-triazine, phenylureas, etc.) was inhibited by sewage sludge, but enhanced by manure. (Author abstract reprinted by permission of the American Chemical Society)

78-2324. Joyce, J. C.; Sikka, H. C. (Aquat. Plant Control Sect., Jacksonville Dist., Corps Eng. Jacksonville, FL 32201) **Residual 2,4-D levels in the St. Johns River, Florida.** *J. Aquat. Plant Manage.* 15: 76-82; 1977. (7 references)

Residual 2,4-D levels in naturally flowing waters expected to occur during normal, large-scale water hyacinth control operations were evalauted. Also the 2,4-D residues were monitored in commercially available shellfish taken from the treated waters. During water hyacinth chemical control operations, water samples and blue crabs were collected from nine and four locations, respectively. Levels of 2,4-D were well below established tolerance limits and no apparent accumulation was noted from the amount applied during routine control operations in these flowing waters. No apparent correlation existed between quantities of 2,4-D applied and the amount detected in the water. No apparent build-up of 2,4-D was found in downstream areas, and the ambient water quality data were within normal seasonal ranges for these locations.

78-2325. Hashemy-Tonkabony, S. E.; Fateminassab, F. (Lab. Toxicol., Dep. Food Hyg., Univ. Tehran, Tehran, Iran) **Chlorinated pesticide residues in milk of Iranian nursing mothers.** *J. Dairy Sci.* 60(12): 1858-1860; 1977. (7 references)

One-hundred-thirty-one samples of human milk were collected during October, 1974, to January, 1976, throughout the Tehran area. Sources included four maternity hospitals as well as individual nursing mothers outside of hospitals. The samples were collected 1 to 8 days after child birth from women 14 to 42 yr old and from all social strata. The samples were analyzed for chlorinated pesticide residues by gas-liquid chromatography. Insecticides 1,1,1- trichloro- 2,2-bis (*p*-chloro- phenyl) ethane (DDT) (with its metabolites), isomers of benzene hexachloride (γ-BHC), and dieldrin were detected in varying concentration in 101, 108, and 47 samples, respectively. The means and ranges were 0.024 (0.001 to 0.333) ppm, 0.008 (0.001 to 0.046) ppm, and 0.011 (0.001 to 0.028) ppm. These concentrations in human milk represented insecticidal ingestion by infants. The mean dieldrin exceeded the WHO limit and may pose a health hazard. There was no significant relationship between economic status of donors and pesticide in the milk; however, milk from the older nursing mothers contained more DDT than that from young mothers. (Author abstract by permission)

78-2326. Bailey, S. (Min. Agric. Fish. & Food, Pest Infest. Control Lab., Tolworth, Surrey KT6 7NF, England) **Toxic organic chemical residues in animal feeds.** *J. Sci. Food Agric.* 29(4): 411-412; 1978. (3 references)

Pesticide residues in animal feed present problems to both the animal and the consumer. Residues may have a chronic effect on the animal, decreasing growth rate, production rates, and drug metabolism, and may even cause death. The effect to the consumer is the potential buildup of toxic residues in the animal, resulting in human toxicity. Animal feed residues may be caused by direct application, but are more often due to an industrial mistake such as mixing treated and untreated grains. More care and vigilance in industrial production, handling, storage, transport and use of pesticide treated feeds are needed. Adequate records of animal health and performance should be kept by users of animal feeds to prevent pesticide poisoning. [At the 1977 meeting of the Agriculture Group and the Society of Feed Technologists.]

78-2327. Leonard, R. A.; Bailey, G. W.; Swank, R. R., Jr. (ARS, USDA, Watkinsville, GA 30677) **Transport, detoxification, fate, and effects of pesticides in soil and water environments.** In: *Land Applications of Waste Materials* (Ankeny, IA: Soil Conservation Service Society of America): pp. 48-78; 1976. (192 references)

Land disposal alternatives are examined in light of pesticide properties and soil processes affecting pesticide behavior and transport. Considerations include pesticide production and use, pesticide absorption reactions in soils, physical-chemical nature of adsorbates and adsorbents, temperature, soil moisture content, pesticide degradation in soils, photodecomposition, chemical degradation, microbial degra-

dation, pesticide persistence in soils, pesticide concentration, spatial effects, pesticide losses to the atmosphere, pesticide mobility and leaching in soils, pesticide runoff, proximity of the runoff-producing rainfall to application, runoff-producing rainfall characteristics, rate of pesticide application, mode of application, antecedent moisture content, pesticide formulations, pesticide fate in the aquatic environment, dispersal and distribution, specific aquatic fate of pesticides, aquatic effects and management of pesticide wastes. Numerous tables give the estimated production of herbicides and insecticides in the United States in 1971, estimated use by region of selected pesticides in 1971, pesticide market at user's level based on 1974 prices, physical properties and toxicity of selected insecticides and herbicides, physical properties of soil constitutents, pesticide persistence in soils and other data.

78-2328. Deelstra, H. (Univ. Instelling, Antwerp Univ., Antwerp, Belgium) **Organochlorine insecticide levels in various fish species in Lake Tanganyika.** *Med ed. Fac. Landbouwwet. Rijksuniv. Gent* 42(2): 869-881; 1977. (28 references)

Pollution in Lake Tanganyika is monitored by studying the levels of contaminants in the fish in the lake. The lake is surrounded by plantations of different crops including cotton, cane sugar, rice and coffee. The main crop is cotton, which is subject to severe insect damage. Heavy applications of pesticides are used. The fields are treated mainly in May and June, with the fields along the lake being treated by manual and aerial applications. During 1971 to 1972 fields were treated with a total of 30,900 kg DDT, 9,200 kg endosulfan, 4,200 kg endrin and 1,000 kg dicofol. Residues may reach the lake by direct contamination from aerial spray, but the greatest source is the run-off from treated fields in the plain along the Ruzizi River. Unauthorized disposal or accidents also account for some entry. The amounts of residues in the fish are below the allowable limits, but are higher than amounts found in other parts of Africa. The lake has no outlet, so the accumulation of pesticides means an increasing danger to the environment.

78-2329. Suet, D. L. (Natl. Veg. Res. Stn., Wellesbourne, Warwick, England) **Influence of soil tilth and method of application of chlorfenvinphos on its persistence and distribution in soil and uptake by cauliflowers.** *Meded. Fac. Landbouwwet. Rijksuniv. Gent* 42(2): 1779-1788; 1977. (23 references)

The effects of soil tilth and different application methods of chlorfenvinphos to cauliflowers to control cabbage root fly were studied with regard to the insecticide's persistence and distribution in soil and uptake by the plant. Residue analysis showed that there were no significant differences in rates of loss of total residue between applications to wet, dry, coarse or fine tilth soil. Isomerization, however, was greater in the fine than in the coarse tilth applications and greater in the wet than in the dry treatments. There was more uniform distribution of insecticide in the wet soil. Soil residues were found to be greater after application of the insecticide as a liquid drench. Most of the insecticide in this and a granule spot treatment remained in the 0-25 mm soil stratum; in the sub-surface granule band application, it was distributed more evenly 100 mm deep. Residue concentrations in the roots were highest in the sub-surface granule band application and lowest in the granule spot treatment. The residue concentrations reached a maximum after 4 wk with all treatments. Between-plant variability was greatest in the granule spot treatment, which also gave least residues in the roots and poor distribution in the soil, thereby restricting the effectiveness of this treatment.

78-2330. De Baets, A.; Weber, K. H. (Fac. Agric. Sci., Cent. Tob. Res., Ghent, Belgium) **The decline of residues from plant protectives on tobacco.** *Meded. Fac. Landbouwwet. Rijksuniv. Gent* 42(2): 1813-1823; 1977. (4 references)

Agricultural chemicals used internationally for the protection of tobacco are reviewed, and recent trends in residue levels from such chemicals are described in detail. A drastic decline of residues from DDT and other organochlorine insecticides started about 1970 and has continued ever since. No residues or extremely small amounts are left after treatment of tobacco with organophosphorus compounds or carbamate insecticides. No residues are left after treatment with azinphosethyl and methyl, demeton methyl, dichlorvos or monocrotophos, while such residues are below 1 ppm after treatment with ethoprophos, malathion, phosalone or tetrachlorvinphos. Protection of tobacco against blue mold still requires dithiocarbamates; thus, residue levels may be high in years of severe attacks. No dithiocarbamates are found in tobacco smoke. Residues of plant protectives are reduced during aging, fermentation and manufacture of tobacco goods, and the rate of transfer to smoke is very low.

78-2331. Dejonckheere, W.; Steurbaut, W.; Verstraeten, R.; Kips, R. H. (Dep. Crop Prot. Chem., Fac. Agric. Sci., State Univ. Gent, Gent, Belgium) **Residues of organochlorine pesticides in human fat in Belgium.** *Meded. Fac. Landbouwwet. Rijksuniv. Gent.* 42(2): 1839-1847; 1977. (7 references)

Research was carried out in 1975 to determine the amount of residues of hexachlorobenzene (HCB), lindane and its alpha and beta isomers, heptachlor epoxide, dieldrin, *p,p'*-DDE, *p,p'*-DDD (TDE), and *p,p'*-DDT in human fat. Residues were analyzed in 60 perirenal fat specimens obtained during routine pathological examinations. The mean concentrations detected were as follows: 1.36 ppm for HCB, 0.76 ppm for β-HCH (β-BHC), 0.38 ppm for heptachlor epoxide, 0.26 ppm for dieldrin, 6.50 ppm for *p,p'*-DDE, 0.27 ppm for *p,p'*-DDD, and 1.52 ppm for *p,p'*-DDT. All examined samples of human fat contained organochlorine pesticides.

78-2332. Moradeshaghi, M. J.; Weinmann, W. (Fac. Agric., Univ. Teheran, Karaj, Iran) **Rueckstaende von Diazinon in Sojabohnenflanzen in Abhaengigkeit vom Diazinongehalt des Bodens. [Residues of diazinon in soybeans depending on the diazinon content of the soil.]** *Nachrichtenbl. Dtsch. Pflanzenschutzdienstes (Braunschweig)* 29(8): 115-119; 1977. (16 references) (German)

The fate of diazinon residues was studied in soil and plants in experiments with soybeans in the greenhouse. Diazinon-10-Granules at 1 kg/m^3 was used a preplanting application, with 1 g/m added 45 days later as a side dressing to the soil. Soybean emergence was delayed up to five days due to the pesticide application. Gas chromatography showed that the uptake of diazinon by the plants was high. Three mo after the last application 5.5 mg/kg of diazinon were found in the sprout, yet no residues could be found in the seeds. The degradation of diazinon in soil appeared to be quick. Only 20% of the diazinon could be found 45 days after the first application, and 150 days after the second application only 2.3 mg/kg was found. Leaching of diazinon in the soil was small and only minor residues were detected in the 5-18 cm layer.

78-2333. Strzelec, A. (Inst. Food Product. Soil Sci., Pol. Inst. Agric. Microbiol., Pulaway, Poland) **Rueckstandsdynamik von Atrazin in verschiedenen Bodenarten. [Residue dynamics of atrazine in various soil types.]** *Nachrichtenbl. Pflanzenschutz DDR* 31(10): 210-214; 1977. (German)

Residue dynamics of atrazine were studied in the laboratory on five soil types which differed in physical and chemical properties as well as in microbial activity. The addition of atrazine to soil at 10-100 ppm generally had a stimulating effect on the total number of actinomycetes and bacteria present. In chernozem the stimulating effect of atrazine was apparent only during the first 2 mo of the experiment; after this the total microbe count declined. A stimulating effect on soil respiration was also observed, and was especially apparent in soils of low organic matter content. The effect of atrazine on soil fungi and nodulating bacteria was variable. The rate of atrazine degradation in soil was closely related to the soil chemical and physical properties and less closely to the total microbial counts in soil. Applied at the rate of 1000 μg atrazine (active ingredient) per 100 g soil (dry weight), the herbicide was degraded to the extent of 42% - 85% within 4 mo. A trend to decreasing herbicide degradation with increasing ion exchange capacity of the soils was seen. In soils with high organic matter content larger amounts of the herbicide are apparently bound by the organic colloids, which bind the sorbed ions less closely than the mineral colloids.

78-2334. Yamaguchi, M.; Kawaguchi, Y.; Kuwano, K.; Asada, Y. (Sect. Hyg. Chem., Dep. Environ. Pollut., Nagasaki Prefect. Inst. Public Health & Environ. Sci., Nagasaki, Japan) **[Pesticide residues in foods. Part 7.]** *Nagasaki-Ken Eisei Kogai Kenkyusho (Annu. Rep. Nagasaki Prefect. Inst. Public Health & Environ. Sci.)* 16: 96-98; 1976. (Japanese)

Results of determination of pesticide residues in 9 species of vegetables (49 specimens), 3 species of fruits (30 specimens), 5 specimens of rice grain, 3 specimens of tea and 10 specimens of cow's milk were reported. The type of pesticide analyzed were arsenic, lead, total BHC, captafol, captan, chlorobenzilate, chlorfenvinphos, dicofol, DDT, dieldrin, endrin, diazinon, dichlorvos, dimethoate, EPN, fenitrothion, fenthion, phenthoate, malathion, parathion and carbaryl. BHC was detected in 2 samples of potato, 4 samples of cucumber, 3 samples of tea, one sample of tomato and 5 samples of summer orange peelings at levels of 0.001-0.006 ppm. However, higher levels were found in rice, 0.022-0.028 ppm. DDT was detected in only one cucumber and one tomato in minute amounts. Dieldrin was detected in 3 samples of cucumber, and one value was as high as 0.024 ppm above the tolerance level. No organophosphorus pesticide nor carbaryl was detected in any samples. The average amounts of residual BHC and DDT in cow's milk were 0.012 and 0.002 ppm, respectively, and that of dieldrin was 0.001 ppm. None of the results showed any great difference from the results of the pervious year. Heptachlor was not detected in any sample.

78-2335. Yamaguchi, M.; Baba, K.; Chikaraoka, Y. (Sect. Hyg. Chem., Dep. Environ. Health, Nagasaki Prefect. Inst. Publ. Health & Environ. Sci., Nagasaki, Japan) **[Comparison of PCB and organochlorine pesticide residues in milk of women from PCB-contaminated area and non-contaminated area.]** *Nagasaki-Ken Eisei Kogai KenkuyShoho (Annu. Rep. Nagasaki Prefect. Inst. Public Health Environ. Sci.)* 16: 133-135; 1976. (Japanese)

Fifteen women who had recently delivered were chosen from the region where the Kanemi oil disease (disease due to vegetable oil contaminated with PCB) was found, and 10 women were chosen from a region where Kanemi oil disease was not found. Their milk was analyzed for PCB and organochlorine pesticides residues. The analysis was actually carried out on the fat extracted from the milk. The total BHC, total DDT and dieldrin contents of the milk fat in the contaminated region averaged 0.016 0.042 and $<$ 0.001 ppm, respectively. Amounts in the non-PCB contaminated region averaged 0.152 0.080 and 0.002 ppm, respectively. A trend toward a gradual increase in the organochlorine pesticide residues was found in the results of 1971, 1975 and 1976.

78-2336. Roan, C. C.; Vinopal, J. H. (US Army Environ. Hyg. Agency, Aberdeen Proving Ground, MD 21010) **Environmental sampling in the Panama Canal Zone, 1 December 1976.** *Natl. Tech. Inform. Serv.* AD-A034, 765: 15p.; 1977.

This is a report evaluating the pesticide residue data obtained from environmental samples of water, sediment, and soil collected during CY 73 through TY 75 from the Canal Zone for their adequacy in preparing an environmental pesticide profile. The water and sediment data do not indicate any significant contamination of the aquatic environment by persistent pesticides. The soil data, although not sufficiently complete, tentatively indicate that the disappearance of even persistent pesticides may be exceptionally rapid in the tropical climate of the Canal Zone. This report also discusses the nature and scope of pest management operations in the Canal Zone. (Author abstract by permission)

78-2337. Usutani, S.; Nishiyama, K.; Sato, I.; Matsuura, K.; Sawada, Y. (Sch. Public Health, Fac. Med., Hirosaki Univ., Hirosaki, Aomori, Japan) **[Studies on exposure to pes-**

ticides and blood levels of organophosphorus pesticides in farmers engaging in joint control efforts in apple orchards.] *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 27(1): 79-88; 1978. (15 references) (Japanese)

The level of exposure to pesticide (concentration in inhaled air), the concentration of the pesticide in blood, and the changes in several enzymes were examined in the operator of a speed sprayer and his assistant, engaged in cooperative pest control projects in apple orchards. The pesticides applied were fenitrothion and salithion. Average concentration of salthion in the air inhaled by the operator during application of an 800 - 1000 fold dilution of salithion WP (25%) was 0.0116 mg/m^3, with a standard error of 0.00191 mg/m^3. Before and after spraying on 2 consecutive days the maximum concentration of salithion in the serum of the operator was 0.032 μg/2 ml and that of the assistant was 0.061 μg/2 ml, while those of fenitrothion were 0.029 and 0.043 μg/2 ml, respectively. However, the residual pesticide in the serum had almost disappeared by the next morning. After 2 days' consecutive application, no accumulation nor increase in serum pesticide residue was detected. The concentrations of *p*-nitro- *m*-cresol in the 24 hr urine of the operator and assistant for the day including the spraying operation were 0.01333 and 0.02291 mg/dl, respectively. No significant correlation was observed between the serum concentration of the pesticide and any change in GOT, GPT and ChE activity.

78-2338. Sethi, R. K.; Chopra, S. L. (Dep. Chem. Biochem., Punjab Agric. Univ., Ludhiana, India) **Adsorption and the behaviour of pesticides in soils.** *Pesticides* 11(2): 15-25; 1977. (48 references)

Adsorption, the most significant of the processes influencing the fate and behavior of pesticides in soils, is described and the literature pertaining to pesticides in the soil is reviewed. Adsorption phenomena, adsorption models, and pest control chemicals are discussed. Factors influencing the adsorption of pesticides by soil colloids are the physico-chemical character of the adsorbent, the physico-chemical character of the adsorbate, the soil reaction, temperature, salts, and adsorption mechanisms (physical adsorption, hydrogen bonding, ion exchange). Pesticide behavior in soils is described with respect to leaching and movement, volatility, persistence, chemical and microbial decomposition, and phytotoxicity.

78-2339. Natarajan, P.; Subramaniam, T. R. (Dep. Entomol., Tamil Nadu Agric. Univ., Coimbatore 641003, India) **Estimation of residues of some granular insecticides in tobacco.** *Pesticides* 11(2): 35-36; 1977. (3 references)

Studies were undertaken to determine the residues of aldicarb, disulfoton, and phorate in tobacco. The insecticides were applied at the time of transplanting at 1.5 kg AI/ha and 1.0 kg AI/ha in circular furrows. Residues were measured after harvest (105 days after application). The residue levels of phorate from plots receiving 1.5 kg AI/ha and 1.0 kg AI/ha were 0.160 and 0.135 ppm, respectively; these values are below the tolerance level of 0.5 ppm. The residue levels of disulfoton from plots receiving 1.5 kg AI/ha and 1.0 kg AI/ha were 0.340 ppm and 0.265 ppm, which is far below the tolerance limit of 0.75 ppm. The levels of aldicarb from plots receiving 1.5 kg AI/ha and 1.0 kg AI/ha were 0.110 ppm and 0.085 ppm, respectively, again below the tolerance limit of 0.2 ppm.

78-2340. Deshmukh, S. N.; Singh. J.; Kalra, R. L. (Hindustan Insectic. Ltd., New Delhi, India) **Methods of reducing DDT residues from food commodities.** *Pesticides* 11(2): 51-54; 1977. (19 references)

Because DDT has been helpful to mankind in many ways, attention is given to methods of reducing its undesirable residues rather than discontinuing its use. The removal of residues from domestic animals involves decontamination of poultry by the forced moult procedure and decontamination of dairy cows through administration of thyroprotein or charcoal. Removal of residues from animal feeds can be achieved by water washing, solvent washing, warm air treatment, solvent vapor treatment, commercial dehydration, or drying in sun or UV light. Removal of residues from fruits and vegetables can be achieved through normal food processing, canning operations, washing, blanching, and peeling.

78-2341. Gupta, R. C.; Vaz, R.; Nilsson, B. A. (Natl. Inst. Occup. Health, Ahmedabad 380016, India) **Polychlorinated biphenyls: notes on a comparative experiment reflecting PCB pollution in Sweden and India.** *Pesticides* 11(4): 11-16; 1977. (7 references)

An experiment was carried out to compare PCB pollution in Sweden and India. PCB, *p,p'*-DDT and *p,p'*-DDE levels in the blood of 3 Swedes, one Kenyan living in Sweden 12 yr, and one Indian were analyzed. PCB was present in all samples except that from the Indian. The Indian, however, had the highest level of *p,p'*-DDE. The levels of *p,p'*-DDT were below the detection limit in the Swedes and the Kenyan. The Kenyan had the highest level of PCB; however, this is probably due to the fact that his job involved handling of PCB contaminated samples.

78-2342. Lal, R.; Verma, S. (Div. Entomol., Indian Agric. Res. Inst., New Delhi 100012, India) **Environmental pollution with insecticides used in agricultural in India and measures to combat it.** *Pesticides* 11(6): 30-35; 1977. (24 references)

Information is given on pesticide residues in India that has been collected at various agricultural universities and government organizations. Considerations include pesticide residue estimatin techniques, methods for reducing pesticide residues and measures to combat pollution from insecticides. Pesticide residues have been detected on practically all of the cereals, stored grains, etc. Tables give residues of insecticides in the grains at harvest, waiting period for harvest of vegetable and pulse crops treated with pesticides, pesticides treatments deemed hazardous, contamination in the food commodities from a Delhi market and residues of insecticides in

soil without crops. Data are given on the effect of washing on the reduction of insecticide residues. It is considered imperative to rigidly apply legislative measures like the Insecticide Act of 1968 enforced in 1971. This involves the use of safer pesticides, properly formulated materials, monitoring of crop products, determination of the waiting period between the last pesticidal treatment and the harvest, and development of residue analysis.

78-2343. Kathpal, T. S.; Bhatnagar, V. S.; Gupta, H. C. L.; Srivastava, B. P. (Pestic. Residue Lab., Rajasthan Coll. Agric., Univ. Udaipur, Udaipur 313001, India) **Residues of endosulfan in/on ber (*Zizyphus jujuba* Lamk) fruits and leaves.** *Pesticides* 11(8): 37-39; 1977. (10 references)

To examine the amounts of endosulfan residues on ber fruits and leaves, the plants were given 3 sprays of 0.1% endosulfan at triweekly intervals, and residues were assessed by colorimetry. The residues were found to be 2.14 ppm and 5.14 ppm one day after the second and third sprays, respectively. Within 5 days of application, the residue levels were below the tolerance level of 2 ppm. Within 21 days after application, residues were undetectable. If the fruits were washed thoroughly one day after application, residues were removed.

78-2344. Cserhati, T.; Vegh, A. (Res. Inst. Plant Prot. Budapest, Hungary) **The pH and temperature dependence of the decomposition of the herbicide linuron.** *Proc. Hung. Annu. Meet. Biochem.* 16:137; 1978.

Experiments were performed to determine the pH and temperature dependence of the decomposition of linuron. Linuron concentrations were measured by an electron capture detector gas chromatograph. Systems were tested at pH values of 4, 6, 8, and 10, and at temperatures of 10, 20, 40, 60, and 80°C. The decomposition rates were highest at pH values of 4 and 10, with the temperature dependence being nearly identical. The decomposition pattern of linuron was first order, and the decomposition product was identified as 3,4-dichloro- aniline. The energy of activation was calculated by the Arrhenius equation, and was found to be 21.8 ± 2.2 kcal/mol.

78-2345. Duffee, R. A.; Kalika, P. W.; Hopper, T. G.; Huston, R. P. (TRC Res. Corp. New England, Wethersfield, CT 06109) **Solution of a toxic emission problem: case history of a pesticide plant.** *Proc. Annu. Purdue Air Qual. Conf.* 15:328-346; 1976.

An order survey was conducted to assess complaints from the community and employees at an insecticide plant. Symptoms of toxic reaction to materials used in the process and to the final product (not named in the report) were exhibited. The manufacturing process involved the reaction of a polycyclic intermediate and methyl isocyanate (MIC) in the presence of a liquid catalyst, and a halogenated solvent, methylene chloride (MC1) was used as a coolant. The solid material produced was mixed with clay and bagged in Kraft paper bags. Pollution was controlled by the use of two baghouses in series, one mainly a product collector and the other a backup, and a scrubber with 20% caustic. Individual elevators and packing areas were all vented through the caustic scrubber followed by a cyclone demister. Studies showed that the principal sources of community odors were scrubber emissions and warehouse ventilation. The scrubbing process actually doubled the odors. The warehouse odor was traced to storage bags. Pilot plant experiments were carried out to determine the optimal method for controlling the toxic odor emissions. After evaluation of several methods, it was apparent that only flame incineration reduced odorous emissions to acceptable levels. Investigation of the packaging material led to the selection of tote bins as the best packaging/transport system. In recognition of the ventilation problem, and the difficulty and time needed in correction, it was decided to isolate the wet and dry process portions and treat them separately. The manufacturer has expanded the plant, and a new incinerator has been designed to permit longer residence time and higher temperatures for more complete combustion.

78-2346. Albert, L.; Reyes, R. (Cent. Invest. Estud. Adv., Inst. Politech. Nac., Mexico City, Mexico) **Plaguicidas organoclorados II. Contaminacion de algunos quesos mexicanos por plaguicidas organoclorados. [Organochlorine pesticides II. Contamination of some Mexican cheeses by organochlorine pesticides.]** *Rev. Soc. Quim. Mex.* 22(2): 65-72; 1978. (17 references) (Spanish)

Organochlorine pesticide residues were analyzed in 30 cheese samples obtained from local markets or supermarkets in various Mexican cities. All the samples analyzed contained α-BHC, about 90% contained *p,p'*-DDT, and about two-thirds of the samples contained *p,p'*-DDD (TDE) and γ -BHC (lindane). Dieldrin, endrin, aldrin, and β-BHC were detected in smaller numbers of samples. No cheese examined was completely free of organochlorine residues; from 2 to 8 pesticides were present in each case. In 6 cheeses the residues of one or more pesticides were in excess of the limits established by the FAO/WHO. The residue frequencies and levels observed were considerably higher than those recently reported from other countries, and were approximately equivalent to those found in other countries prior to the imposition of restrictions on the use of organochlorine pesticides.

78-2347. Van Assche, C.; Feys, J. L. (Kathol. Univ. Leuven, Fac. Landbowwet. Lab. Fytopathol. Plantenbescherming, 3030 Heverlee, Belgium.) **Problemes parasitaires, phytiatriques et de residus poses par la culture du witloof (*Cichorium intybus*). [Parasite control and residue problems in witloof chicory (*Cichorium intybus*) growing.]** *Rev. Agric.* 30(5): 1169-1186; 1977. (French)

Benefits and problems arising from the chemical control of the witloof fly (*Napomyza cichorii*), nematodes, dry rot caused by *Sclerotinia sclerotiorum, Verticillium albo-atrum, Fusarium spp.* and *Phytophtora cactorum* in chicory are discussed. The effects of several soil disinfectants, 11 fungicides [PCNB, dichloran (DCNA), dichlorfluanide,

tolyl fluanide, benomyl, carbendazin, methyl-thiophanate, captafol, chlorthalonil, vinclozolin, glycophene] on crop yields are evaluated and soil and root residues of methyl bromide, HCB (hexachlorobenzene), PCNB, PCA (pyrazon), benomyl, methyl-thiophanate and carbendazim used as soil disinfectants are tabulated. The chemicals were applied in field tests before sowing, residues were determined in 3 consecutive mo of the growing season. The 1,3-dichloro propene-chloropicrin and methyl- bromide- chloropicrin mixtures had the best effect against "soil fatigue" as soil disinfectants, and doubled the yield of cichory. If used according to directions, pesticide residues in roots did not exceed the permissible levels of 30 ppm for bromides, 2 ppm for BCM-based products, 1 ppm for PCNB, O ppm for HCB, 5 ppm for dichlorofluanide and 1 ppm for dichloran.

78-2348. Syrowatka, T.; Palut, D.; Gorski, T.; Tulczynski, A. (Inst. Health Toxicol., Natl. Inst. Hyg., Warsaw, Poland) **Poxostalosci zwiazkow zawierajacych chlorowce w tkance tluszczowej dzieci z terenu miasta Warszawy. [Residues of chlorinated hydrocarbons in fatty tissue of children from the city of Warsaw.]** *Rocz. Panstw. Zakl. Hig.* 29(2): 213-218; 1978. (13 references) (Polish)

Chlorinated hydrocarbon residues were determined in the adipose tissue of children during 1976-1977. The maximal level of *p,p'*-DDE found in 64 samples was 1.864 mg/kg of tissue while the maximal levels of *p,p'*-DDT and *o,p'*-DDT found in 59, 10 and 23 samples were 0.972, 0.072, and 0.119 mg/kg, respectively. In 47 samples the β-HCH (β-BHC) isomer was present in amounts from 0.006-0.980 mg/kg. The maximal concentrations of α- and γ- HCH (BHC) and HCB (hexachlorobenzene) were 0.024, 0.049 and 0.097 mg/kg in 8, 46 and 28 samples, respectively. Age was not a factor in the findings.

78-2349. Sato, Y.; Naono, Y.; Sugiyama, H. (Author address not given.) **[Residual level of fenitrothion on mulberry leaves and its toxicity to silkworm larvae.]** *Sanshi Kenkyu* 99: 41-53; 1976. (9 references) (Japanese)

Potted mulberry trees were treated with practical concentrations and volumes of MEP (fenitrothion) formulation and left out of doors under no rainfall conditions. Mulberry leaves were given to the 3rd instar larvae of the silkworm successively throughout the larval instar from a definite day after the application of MEP. Dead larvae were noted in every group when larvae were reared with leaves which were left for 15 days after the application of emulsion and powder of MEP and for 12 days after the application of wettable powder. After 15 days exposure to MEP at 0.07 ppm a 5% mortality of silkworm larvae was noted. Larvae fed with leaves treated by wettable powder and left for 15 days showed no signs or abnormal behavior. No residue of MEP was found from this sample of mulberry leaves. The 5th instar larvae of the silkworm were successively reared by leaves from mulberry trees left in the mulberry field for a definite period after MEP exposure. Larvae reared on leaves obtained on day 15 after application of emulsion, those reared on leaves taken the 13th day after exposure to a wettable powder, and those fed with leaves taken the 7th day after powder exposure had dead larvae in each group. Leaves taken 17 days after application caused no abnormalities among the larvae. However, residual levels of 0.02 to 0.13 ppm were detected in these leaves. Therefore the residual duration of MEP on mulberry leaves was more than 17 days in both conditions of no-rainfall and in the field. Tolerance of silkworm to MEP appeared to be less than 0.02 ppm.

78-2350. Niki, Y.; Kuwatsuka, S. (Fac. Agric., Nagayo Univ., Nagoya, Japan) **Degradation of diphenyl ether herbicides in soils.** *Soil Sci. Plant Nutr. (Tokyo)* 22(3): 223-232; 1976. (20 references)

Gas chromatography was used to determine amounts of diphenyl ethers and their amino derivatives released into the soil by diphenyl ether herbicides. The degradation was studied under flooded and upland conditions. The degradation was much slower under upland than under flooded conditions, and the amino derivatives were hardly detected in soils under upland conditions. Greater amounts of amino derivatives were produced when the parent diphenyl ethers were degraded more rapidly. Under flooded conditions, nitrofen and CFNP were degraded faster than CNP and chlomethoxynil. There were no remarkable differences between the soil types examined. The amino derivatives seemed to be the major metabolites in the earlier stages of incubation, whereas later, the amino derivatives were also converted to other compounds or were adsorbed by soil constituents. It is suggested that the diphenyl ether's degradation to amino derivatives involves both chemical and microbial processes.

78-2351. Leidy, R. B.; Sheets, T. J. (Pestic. Residue Res. Lab., North Carolina State Univ., Raleigh, NC 27650) **Residues from two formulations of acephate on flue-cured tobacco.** *Tob. Sci.* 22(13): 77-80; 1978. (8 references)

Residues levels were determined of acephate and its primary metabolite, methamidophos, after application of emulsifiable concentrate and soluble powder formulations to flue-cured tobacco. In addition, residue levels on leaf samples from different stalk positions were determined as well as the effect of flue-curing on residue levels. Residues on bottom leaves immediately after application of the emulsifiable concentrate averaged 16.7 and 51.4 ppm at the 0.56 and 1.12 kg/ha rates, respectively. Corresponding values for the soluble powder formulation were 20.0 and 58.2 ppm. Residues were about 2.6 times greater for middle leaves, with upper leaf residues about 2.6 times that for the middle leaves. The decline in residues was 47% one day after application for both rates of application with the powder. With the concentrate, residues from the 0.56 kg/ha rate did not decline, while the level from the 1.12 kg/ha rate was 76% of that immediately after application. Residue levels were similar for the two formulations during the remainder of the sampling period. Residues of methamidophos increased through day five on green tobacco and then declined by the ninth day. Methamidophos residues were greater than those for acephate

at day three and day five. The total residue averaged 0.20 ppm on the fifth day, with a 97% average loss during curing. Flue-curing had a much greater effect on residues than did weathering.

78-2352. Davies, H. A.; Marsh, J. A. P. (Agric. Res. Counc., Weed Res. Org., Yarnton, Oxford OX5 1PF, England) **The effect of herbicides on respiration and transformation of nitrogen in two soils II. Dalapon, pyrazone and trifluralin.** *Weed Res.* 17(6): 373-378; 1977. (6 references)

The effects of dalapon, pyrazone and trifluralin on carbon dioxide evoluation from, and nitrogen transformation in two soils are reported. Soils came from arable and permanent grass fields. Herbicides tested included dalapon as a water-soluble powder, pyrazone as a wettable powder, and trifluralin as an emulsifiable concentrate. Treatment of both soils with dalapon caused an initial stimulation of carbon dioxide evolution. With triangle soil, this stimulation lasted for the first 8 wk in contrast with Boddington Barn soil, where the effect lasted only 2 wk. Dalapon treatment did not reduce nitrification in Boddington Barn soil, but there was a temporary inhibition of nitrification in Triangle soil. Pyrazone treatment caused initial stimulation of carbon dioxide evolution from both soils which lasted 4 wk. A further stimulation, lasting for 4 additional wk, occurred in Triangle soil after 14 wk incubation period. Pyrazone temporarily reduced nitrifiation in Triangle soil, but not in Boddington Barn soil. A small stimulation of nitrogen mineralization was noted in each soil. Nitrite was not detected at any time. A slight temporary reduction in nitrification was noted in Triangle soil treated with trifluralin. This effect was not found with Boddington Barn soil. The effects of the herbicide on mineralization of nitrogen were small. There was an increase in the amount of inorganic nitrogen in Triangle soil following treatment with trifluralin. In Boddington Barn soil there was a slight reduction in inorganic nitrogen after 9 wk incubation. No nitrite was found at any time. Trifluralin degraded slowly in both soils with the rate being slightly faster in Boddington Barn soil.

78-2353. Walker, A.; Thompson, J. A. (Natl. Veg. Res. Stn., Wellesbourne, Warwick CV35 9EF, England) **The degradation of simazine, linuron and propyzamide in different soils.** *Weed Res.* 17(6): 399-405; 1977. (12 references)

Simazine, linuron and propyzamide were incubated in 18 different soils at 25°C and field capacity soil moisture content. The degradation of each herbicide followed first-order kinetics. The half-life of simazine varied from 20 to 44 days, that of linuron from 22 to 86 days and that of propyzamide drom 10 to 32 days. The rate of linuron degradation was significantly correlated with soil organic matter content, clay content, soil respiration, and the extent of herbicide adsorption by the soil. The rate of simazine degradation was significantly and negatively correlated with soil pH, but the rate of propyzamide degradation was not related with any of the soil factors examined. (Author abstract by permission)

See also **78-2496.**

78-2354. Anonymous **Endangered animals in Sweden.** *Ambio* 7(3): 130-131; 1978.

Changes in agricultural practices along with industralization and urbanization of the country have wrought great changes in land use and fundamentally altered the ecological balance in Sweden. Pesticides and other environmental contaminants are among the major threats to wildlife. Since many persistent poisons tend to accumulate in ecological food chains, it is particularly the animals of prey that are threatened. Previous use of mercury as a seed dressing in agriculture caused a reduction in populations of many seed-eating birds, and also of birds that preyed on them. Contamination of the Baltic with DDT and PCB has caused a decrease in reproduction among seals. The grey seal is particularly affected, with only about 20% of the females in the central Baltic being able to reproduce. Reproduction of white-tailed eagles nesting along the Baltic is greatly reduced due to toxic substances. High levels of PCB and DDT have been noted in guillemot tissues and eggs.

78-2355. Reggiani, G. (Clin. Res., F. Hoffmann-La Roche & Co., CH-4002 Basel, Switzerland) **Medical problems raised by the TCDD contamination in Seveso, Italy.** *Arch. Toxicol.* 40(3): 161-188; 1978. (50 references)

The health consequences and preventive measures taken are described in the wake of an industrial accident that occurred in July of 1976 at the Icmesa Factory near Seveso, Italy in which the surrounding urban area was exposed to 2,3,7,8- tetrachlorodibenzo- *p*-dioxin (TCDD). It was estimated that 750 persons were exposed to 7.49 mg each in the zone of highest exposure and that 5000 persons were exposed to 2.65 μg each in the second highest exposure zone. The early assessments of health hazards and preventive measures are detailed as well as the effects on the environment. Typical skin lesions known as chloracne appeared almost exclusively in children and young people. The intenstity of lesions was mild, and spontaneous healing occurred in the majority of the cases. Health assessment one year after exposure showed no systemic pathological conditions. Transient decrease of lymphocytes and temporary signs of liver function impairment were found. There were no embryotoxic or teratogenic effects that could be directly linked to TCDD exposure. In constrast to animal studies there were no abnormal chromosomal effects, and no increase in the cancer incidence has been observed yet. It is suggested that exposure to TCDD represents a much greater risk to workers invaded with this chemical than to an exposed population such as that in the Seveso area because the chemical becomes diluted in the environment.

78-2356. Main, D. C. (Dep. Agric., Bunbury, Western Australia, 6230 Australia) **Endrin toxicity in cagebirds.** *Aust. Vet. J.* 54(4): 198-199; 1978. (6 references)

The death of 320 cagebirds, predominantly finches, after eating endrin treated seed is reported. Some doves and quails were also affected. Panicum seed had been obtained from a source not usually used by this aviary. Two days after introduction of the seed, birds began dying and losses rapidly rose to 50 per day. Birds with clinical signs were unstable in flight, found it difficult to alight and often ended a flight hanging upside down by one leg. Five days after introduction of the seed feed, it was removed and replaced by seed from the regular supplier. The death rate tapered off. Canaries were not affected by the seed. The eating habits of the finches and canaries differ significantly, which probably explains the lack of harm seen in canaries. The analysis of the seed mixture causing mortalities showed 2.2 mg/kg endrin and 1 mg/kg DDT. It is clear that use of chemicals such as endrin either as seed dressings or on crops intended for bird seed production presents a hazard of which growers should be aware.

78-2357. Owens, C. B. ; Owens, E. W.; Zahn, D. (Florida A&M Univ., Tallahassee, FL) **The extent of exposure of migrant workers to pesticide and pesticide residues.** *Int. J. Chronobiol.* 5(2): 428-429; 1978.

Pesticide exposure and residues were studied in four migrant work crews harvesting vegetables and fruits treated with organophosphate or carbamate insecticides along the Atlantic Coast Migrant Stream. Baseline levels were established by complete physical examinations, medical histories, nutritional and psychometric profiles and x-rays. One crew showed depressed blood cholinesterase activity after harvesting corn treated with Lannate (methomyl). Forty-eight percent of another crew showed significant cholinesterase depression after harvesting citrus, tomatoes and gladiolas. A third crew, as a whole, showed depression of red blood cell cholinesterase up to 24% after harvesting citrus treated with trithion (carbophenothion), with some individual red blood cell activity being depressed as much as 56%. The fourth crew showed similar activity when harvesting citrus treated with trithion and peaches sprayed with Lannate, parathion and Guthion (azinphosmethyl). This crew also showed a net increase in weight over the 12 month period, reflecting better dietary habits while in camps along the migrant stream. Better nutrition appeared to influence the blood cholinesterase activity after exposure to organophosphate insecticides. Significant levels of alkyl phosphate (up to 6 ppm) were found in the urine of workers harvesting citrus treated with trithion.

78-2358. Wheater, R. H. (AMA Dep. Environ., Public, & Occup. Health, Chicago, IL) **Short-term exposures to pesticide DBCP and male sterility.** *J. Am. Med. Assoc.* 239(26): 2795; 1978.

In reply to a reader's question it is stated that retesting of 35 chemical production workers exposed to DBCP has indivated that their chemically induced sterility is reversible. Clinical data at present are still inconclusive. In 21% of the 35 workers the sperm count has returned to above the 20 million/cc mark. Howwever, some former employees of another chemical firm, who were removed from exposure as much as 12 yr ago, still show signs of azoospermia. It is suggested that fertility of field hands may not be similarly affected, as farm hands and applicators will have only sporad-

ic and intermittent exposure, whereas production workers will have continued contact. Most severely exposed workers demonstrated normal levels of testosterone and luteinizing hormone, with increased levels of follicle-stimulating hormone. There was also a decrease in testicles size, but no notable loss in sexual potency or libido.

78-2359. Clark, D. R., Jr.; Kunz, T. H.; Kaiser, T. E. (US Fish Wildl. Serv., Patuxent Wildl. Res. Cent., Laurel, MD 20811) **Insecticides applied to a nursery colony of little brown bats (*Myotis lucifugus*): lethal concentrations in brain tissues.** *J. Mammal.* 59(1): 84-91; 1978. (22 references)

Chemical analyses were made of the insecticide residues in brains of bats found dead and of bats captured alive in order to define concentrations which are indicative of poisoning. Also examined were carcasses as well as milk and masticated insects from stomachs of the bats. Concentrations of DDT were high enough to be cited as the cause of death in the bats which had been found dead. Lethal brain concentrations of DDT in adult females averaged 24.52 ppm, suggesting that adult *M. lucifugus* are about twice as sensitive to DDT as are adult laboratory mice and rats. Juvenile bats were about 1.5 times more sensitive than were adult bats. Large residues were present in milk. A statistically significant relationship between declines in carcass residues in lactating females and uterine regression for six of ten toxicants was noted. Among juveniles, there were corresponding, significant increases for nine of ten toxicants in carcass levels of residues correlated with increasing age (growth of forearm).

78-2360. Anonymous **D.B.C.P., chlordecone, and the risk-benefit equation.** *Lancet* 2(8080): 79-80; 1978. (8 references)

Although pesticides should be nontoxic to man and other non-pests, toxicity of pesticides to non-target organisms has been manifested due to misuse and accidents. Most pesticide carcinogenesis and mutagenesis studies are carried out using maximum tolerated dosages, rather than smaller, but more realistic dosages. Two pesticides have recently been found to have adverse effects on workers manufacturing them. DBCP (1,2-dibromo- -3-chloropropane) has caused reduced fertility in male factory workers. Out of 25 men, nine were found to be aspermic. All of the 11 men found to have normal sperm counts had been working at the plant for less than 3 months. DBCP seems to diminish the number of spermatogonia. Although many chemicals are produced at this plant, DBCP was suspected to be responsible for this effect, based on reports of testicular damage in rats, rabbits, and guinea pigs. In animals, the infertility appears to be reversible. Chlordecone (Kepone) also affects the testis, as well as the nervous system and the liver. The chlordecone toxicity which has been observed was a result of poor occupational hygiene. The carcinogenicity of chlordecone is still being studied: previous tests seem inconclusive. Both the potential toxicity and the environmental effects of both pesticides need to be studied further.

78-2361. Lederer, J. (Clin. Gen. St-Jean, B-1000 Brussels, Belgium.) **Le probleme des chlorodioxines, la guerre du Vietnam et les accidents de Seveso. [Chlorodioxins in the Vietnam war and in Seveso.]** *Louvain Med.* 96(7): 395-402; 1977. (33 references) (French)

The part that the chlorodioxin compound 2,3,7,8-tetrachlorodibenzo- *p*-dioxin played in the industrial accident at Seveso, Italy and in the war in Vietnam is discussed, as well as its formation during the preparation of the herbicide 2,4,5-trichlorophenoxy acetic acid (2,4,5-T). Included in the discussion are considerations of toxicology, chloracne, chemical properties, pathology in chickens, chronic toxicity, embryotoxicity and gastrointestinal tract effects.

78-2362. Vashkov, V. I.; Gleiberman, S. E.; Volkova, A. P. (All-Union Sci. Res. Inst. Disinf. Steril., Moscow, USSR) **Izuchenie otdalennykh posledstvii primeneniya repellentov. Soobshchenie II. Nekotorye voprosy reglamentatsii primeneniya repellenta dietiltoluamida (DETA). [Study of the remote consequences of the use of repellents. Part II. Some problems regarding regulation of the use of the repellent diethyl toluamide (DEET).]** *Med. Parazitol. Parazit. Bolezni* 45(6): 720-725; 1976. (25 references)

Toxic effects of the repellent diethyltoluamide (deet) are reported. The substance exhibits long-term persistence in the body and produces remote gonadotoxic and embryotoxic effects. These findings make it necessary to reconsider the tactics of its use and to limit direct application of this repellent to the human skin. Various other means of protection such as mechanical means of protecting the individual through clothing or canopy tents are suggested in preference to the use of repellent chemicals on the skin. The fate of all repellents in warm-blooded animals and the occurrence of the remote results of their long-term use should be studied.

78-2363. Breaud, T. P.; Farlow, J. E.; Steelman, C. D.; Schilling, P. E. (Louisiana State Univ., Baton Rauge, LA 70803) **Effects of the insect growth regulator methoprene on natural populations of aquatic organisms of Louisiana intermediate marsh habitats.** *Mosq. News* 37(4): 704-712; 1977. (13 references)

The long range impact of methoprene on populations of non-target aquatic organisms in Louisiana marsh habitats was examined. Six aerial applications of methoprene (28 g AI/ha) during an 18-month period caused significant differences in various populations. Methoprene greatly reduced natural populations of the scud, *Hyalella azteca* Saussure adults and young; opossum shrimp, *Taphromysis louisianae* Banner adults and young; freshwater prawns, *Palaemonetes paladosus* Gibbs adults and young, and many others. The data from the study indicated that of those populations significantly reduced, 7 organisms were collected in significantly greater numbers from the habitat containing emergent vegetation, 2 organisms were more abundant in the open water habitat and 5 were collected in almost equal numbers from both habitats. Organisms not affected by methoprene treatment were collected in greater numbers from the vegetative

habitat, followed by the open water habitat. Three organisms showed no preference for either habitat.

78-2364. Chawla, R. S.; Hothi, D. S.; Singh, B.; Grewal, G. S. (Dep. Vet. Pathol., Coll. Vet. Sci., Punjab Agric. Univ., Ludhiana, India) **Malathion poisoning in poultry - an outbreak.** *Pesticides* 11(10): 30-31; 1977. (7 references)

An accidental field outbreak of malathion poisoning in poultry is reported. To control spirochetosis, which is carried by ticks, a farmer dipped his chickens in malathion emulsion at a concentration 5 to 10 times higher than that recommended for spraying and repeated the treatment after 12 days. As a result, 500 of the 650 birds died. The surviving birds were disposed of. One surviving bird was examined in the laboratory and was found to have 50% inhibition of cholinesterase. During necropsy, congestion and hemorrhages were observed in the liver, kidney, trachea, brain, and ovary, and the glandular epithelium of the proventriculus had undergone desquamative changes. No gross lesions on the viscera were seen.

78-2365. Barnes, J. M. (Late Director, MRC Toxicol. Unit, Med. Res. Counc. Lab., Carshalton, Surrey, England) **Hazards to people.** In: *Pesticides and Human Welfare.* Gunn, D. L.; Stevens, J. G. R., eds. (Oxford: Oxford University Press): pp. 181-192; 1976. (14 references)

The immediate toxic effect of a pesticide in a poisoned person is usually related to its mode of action on the target organ. The nervous system is affected by nicotine, lindane, dieldrin, endrin, parathion, and aldicarb. Another group of pesticides interferes with energy transformation in the tissues; some interfere with oxidative phosphorylation. In general, the pesticides commonly used are not highly toxic to humans, but rather are selective poisons for the target organism. Pesticide poisoning may occur in various circumstances. Occupational exposure in formulation plants may occur, but serious consequences can be prevented. Careless application of pesticides has resulted in some cases of illness, but by far the largest number of poisonings has resulted from misuse of seeds dressed with pesticides to ensure better germination and growth. Knowledge about the manner in which people have been exposed to pesticides has aided in the development of safer methods. More adequate protection against skin exposure or inhalation of pesticides during application has been developed. Another important factor in reducing hazards is the greater control being exercised by a number of governments over the introduction, marketing, distribution, and labeling of pesticides, accompanied by better field services and advice to users. The value of laboratory testing on animals is discussed.

78-2366. Glasser, R. F. **Pesticides: the legal environment.** In: *Pesticides and Human Welfare.* Gunn, D. L.; Stevens, J. G. R., eds. (Oxford: Oxford University Press): pp. 229-239.; 1976. (17 references)

Pesticide laws have evolved from early poison legislation; originally pesticides had often been included in the lists of poisons annexed to such legislation. Legislation is designed to: protect people who may be exposed to acute risks during manufacture, formulation, packaging, transport, and storage; ensure good packaging with proper labeling and prevent direct contamination of food and animal feed; protect people opening containers, diluting a concentrated chemical to obtain the correct field dosage, and subsequently during application; warn against unintentional contamination of non-treated crops, animals, soil and water; protect the buyer against low-quality products or misleading claims; protect consumers against incorrect application of chemicals to food or animal feeds; and ensure that the consequences of the foregoing requirements do not place unwarrented restrictions on the development of new pesticides. Harmonization of registration requirements is desirable. This means that biological efficacy studies, labeling, packaging, toxicological investigations, residue trials, and environmental safety are all viewed as significant in obtaining registration. Typical legislative and regulatory procedures for various countries are briefly outlined. Regulatory schemes are detailed for the Federal Republic of Germany, the United Kingdom, and Japan.

78-2367. Infante, P. F.; Epstein, S. S.; Newton, W. A. (Off. Carcinog. Identif. Classif. Dep. Labor, Washington, DC) **Blood dyscrasias and childhood tumors and exposure to chlordane and heptachlor.** *Scand. J. Work Environ. Health* 4(2): 137-150; 1978. (63 references)

Chlordane and heptachlor are common household pesticides in the United States. Pathological conditions that may be associated with exposure to these pesticides are examined. Cases of neuroblastoma associated with pre-and postnatal chlordane exposure are presented. Cases of aplastic anemia and acute leukemia are also examined, suggesting an association with chlordane and other similar pesticides. This association is of interest because of past literature reports indicating the conversion from aplastic anemia to acute leukemia. These possible associations between the pesticides and neuroblastomas, aplastic anemia and acute leukemia are important in view of recent data on environmental distributions and body burdens. Previous epidemologic studies are too limited to allow the development of the association between chlordane, heptachlor and similar pesticides, and their neoplastic risk. Further studies are needed to evaluate the long and short-term risks of these pesticides.

78-2368. Fukiya, M. (Fresh Water Fish. Exp. Stn., Fish. Ag., Tokyo, Japan) **[Problems in fish toxicity test methods.]** *Shokubutsu Boeki (Plant Prot.)* 32(3): 117-121; 1978. (Japanese)

All pesticides submitted for approval in Japan are examined for their toxicity to aquatic animals and plants. The principal information obtained is the 48 hr median lethal concentration (TLm) in young carp and the 3.5 hr TLm in Daphnia. The effects of pesticides on fisheries should be evaluated from both the physiological and ecological viewpoints. To determine the chronic toxic effects of pesticides it is im-

portant to examine their effects on histopathology, blood chemistry, and cellular chemistry. It is recommended that more species be included in the acute lethal testing and that physiological examinations of the test species be conducted in toxicity trials of candidate pesticides.

78-2369. Gericke, G. S.; van der Walt, A.; de Jong, G. (Genet. Clin., Dep. Paediatr., Univ. Stellenbosch, Parowvallei, CP, South Africa) **Another phenocopy for chondrodysplasia punctata in addition to warfarin embryopathy?** *S. Afr. Med. J.* 54(1): 6; 1978. (4 references)

A female child was examined with features suggesting warfarin embryopathy. She had severely deficient nasal cartilage causing obstructed breathing in association with radiologic findings of chondrodysplasia punctata. The distribution of stippling displayed by the radiographs of this patient corresponded to previous descriptions in that they were present mainly along the vertebral column, the sacral area and the proximal femurs. No exposure to warfarin could be documented.

78-2370. Anonymous **"Stallforetradande" debatt om fenoxisyrorna. ["Representative" debate on phenoxy-acids.]** *Sven. Papperstidn.* 80(13): 395, 421; 1977. (Swedish)

Based on the findings of an international expert committee, a ban was imposed on the use of 2,4,5-T in forestry in Sweden in the fall of 1977. 2,4,5-T contains minute amounts of dioxins. The increased incidence of development malformations (spinal cord defects) and elevated infant mortality in northwestern Varmland is attributed to the aerial treatment of forests with 2,4,5-T in that area. 2,4,5-T has been replaced by 2,4-D and MCPA, which do not contain dioxins. The hazards of phenoxy-acids used in forestry in Sweden are negligible, because only 0.2% of the overall forest area is sprayed.

78-2371. Ivashima, S. A.; Poberezkina, D. Ya.; Kachalai, D. P.; Kaskevich, L. M. (Dep. Clin. Pathol. Chem. Etiol., All-Union Res. Inst. Hyg. Toxicol. Pestic., Polymers & Plastics, Kiev, USSR) **Vyyavlenie rannikh izmenenii pokazatelei reaktivnosti organizma u kontaktiruyushchikh s pestitsidami. [Detection of early changes in the reactivity subjects having contact with pesticides.]** *Vrach. Delo* (3): 136-140; 1978. (9 references) (Russian)

In an attempt to ascertain the early diagnostic symptoms of chemical-induced pathologies, the status of the nonspecific immunity was studied in 105 individuals who had occupational exposure to organochlorine pesticides, 78 individuals who had an exposure to the food antibiotic grisin, and 20 healthy controls. Among the pesticide exposed individuals, 59% were asymptomatic (group I) 25% had mild functional changes in the nervous system, (group II) and 16% had pathology of the hepato-biliary system (group III). All individuals who had exposure to the chemicals showed significant decreases in the blood lysozyme activity (2.3% in group I, 2.8% in group II and 2.1% in group III, compared to 4.8% in controls), decreases in the percentage of phagocytosis (65.7% in group I, 67.2% in group II, and 64.0% in group III, compared to 73.5% in the controls), and increased microbial dissemination of the skin (the total number of colonies on the skin impression culture was 40.8 in group I, 5.9 in group II and 62.4 in group III, compared to 24.4 in controls).

See also 78-2421.

78-2372. Kecskes, M. (Res. Inst. Soil Sci. Agric. Chem., Hungarian Acad. Sci., Budapest, Hungary) **Brief statement on Hungarian research on the interactions of pesticides, microorganisms and higher plants.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1-2): 121-131; 1977. (127 references)

Research carried out in the field of pesticide interactions with microorganisms and higher plants in Hungary during the past 25 years is reviewed. Effects of fungicides (seed dressings) on *Rhizobium leguminosarum* and its symbiosis with *Vicia sativa* were studied. Under the area of zoocides, the effect of lindane, dyfonate, and basudin (diazinon) on glucose assimulation, nitrogen fixation, and intermediary metabolism of *Azotobacter agile* and *A. chroococcum* was studied. Much more research was done in the area of herbicides, with investigations made of the various of gramoxone, simazine diquat, linuron, 2,4-D, DNOC, treflan (trifluralin), atrazine, *N*-phenyl-phthalimide, and isocil. Work on pesticide interactions has involved studies of the effects on the effects on interactin on the growth of axenic cultures, on the qualitative and quantitative changes in soil microbiota, and on the decomposition of pesticides in soil.

78-2373. Brooks, G. T. (Agric. Res. Counc., Unit Invertebr. Chem. Physiol., Univ. Sussex, Brighton, England) **Selective toxicity of insecticides.** *Adv. Environ. Sci. Technol.* 6: 97-155; 1976. (23 references)

Physiological selectivity of insecticides comes into play when equivalent contact between different organisms and the same toxicant result in different acute toxicities. It is related to differences in the morphology and biochemistry of the organisms compared and, therefore, bears directly on the mode of action and design of insecticides. Specific topics discussed in this review of selectivity include: biodynamics and selectivity with reference to observed toxicity and intrinsic activity, the dynamics of toxicant behavior in an insect or other animal, detoxication and syngerism of various aryl *N*-methyl carbamates, penetration through the integument and gut, circulation and distribution, selectivity at the site of action, metabolism and selectivity with emphasis on the principles of metabolism, and the influence of molecular structure. Specific insecticides discussed include: malathion, acethion, dimethoate, parathion, tetrachlorvinphos, carbaryl, DDT, chlordane, sesamex, dieldrin, lindane, pyrethroids, rotenone, nereistoxin and juvenile hormone and juvenile hormone mimics.

78-2374. Soderlund, D. M.; Casida, J. E. (Insectic. & Fungic. Dep., Rothamsted Exp. Stn., Harpenden, Hertfordshire, AL5 2JQ, England) **Substrate specificity of mouse-liver microsomal enzymes in pyrethroid metabolism.** *ACS Symp. Ser.* 42: 162-172; 1977. (15 references)

The effect of structural modification on biodegradability or enzymatic metabolism was studied with 44 pyrethroids using mouse liver microsomal esterase and oxidase preparations. The esterases were found to be the most important in metabolizing primary alcohol esters of cyclopropanecarboxylic acids with *trans* side chains such as isobutyl or dihalovinyl substitutents at cyclopropane C-3. The mixed-function oxidase system dominated the metabolism of all secondary alcohol esters and primary alcohol *cis*-substituted cyclopropanecarboxylates. An α-cyano group in the alcohol was found to greatly reduce the rate of both enzymatic hydrolysis and oxidation. Mice pretreatment with an appropriate esterase or oxidase inhibitor usually showed increased susceptibility to pyrethroid intoxication.

78-2375. Johnson, E. F.; Muller-Eberhard, U. (Scripps Clin. Res. Found., Dep. Biochem., La Jolla, CA 92037) **Resolution of multiple forms of rabbit liver cytochrome P-450.** *ACS Symp. Ser.* 44: 72-80; 1977. (17 references)

Four forms of cytochrome P450 were separated using column chromatography from liver microsomes of rabbits treated with 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD). They appear to be different forms of cytochrome P450 because they can be chromatographically resolved, are immunologically discrete and are spectrally distinguishable. They appear to consist of peptides of different molecular weights (48,000 - 60,000) as determined by polyacrylamide gel electrophoresis. The major form, cytochrome P450*c*, has been purified to near homogeneity and has spectral properties ascribed to cytochrome P448. However, it does not actively hydroxylate benzo(a)pyrene when reconstituted with NADPH-cytochrome P450 reductase. Different substrate specificities are suggested for the forms, and this implies that each form may function in different metabolic pathways.

78-2376. Blekkenhorst, G. H.; Pimstone, N. R.; Webber, B. L.; Eales, L. (Dep. Med., Univ. Cape Town Med. Sch., Cape, Town Union of South Africa) **Hepatic haem metabolism in porphyria cutanea tarda (PCT): enzymatic studies and their relation to liver ultrastructure.** *Ann. Clin. Res. (Suppl.)* 8(17): 108-121; 1976. (50 references)

Attempts were made to correlate levels of hepatic cytochrome P450 seen in porphyria cutanea tarda (PCT) and proliferation of smooth endoplasmic reticulum (SER) on electron microscopy using the same tissue. Hepatic levels of cytochrome P450 were elevated more than 4-fold in porphyria cutanea tarda but not in other hepatic porphyrias or in nonporphyrics with alcoholic liver disease. It was difficult to draw definitive conclusions from the electron microscopic findings regarding the relative abundance of hepatic SER in PCT. While there were individual cells with hypertrophied SER, this was not a constant feature, many cells in fact showed no increase in this organelle. When comparing the amount of SER in heptaocytes of patients with PCT with that in variegate porphyria and protoporphyria, no significant difference was noted in spite of the fact that hepatic cytochrome P450 levels were not elevated in these other porphyrias. The role of iron in PCT was studied indirectly using the hexachlorobenzene porphyria rat as the rodent model.

78-2377. Sentein, P. (Lab. Histol. Embryol., Fac. Med., F-34060 Montpellier, France) **Un inhibiteur de l' appareil**

achromoatique qui altere les chromsomes, la trifluraline. [Trifluralin, a chromosome-damaging inhibitor of the achromatic apparatus.] *Arch. Anat. Microsc. Morphol. Exp.* 66(4): 263-277; 1977. (28 references) (French)

Studies were conducted to determine the relative importance of spindle anomalies and chromosomal alterations caused by trifluralin. The tests were performed on eggs of the caudates *Triturus helveticus* Raz. and *Pleurodeles waltlii* Machah, both because they represent particularly interesting models for mitosis and because they are among the organisms likely to be present in herbicide contaminated water. Trifluralin weakens or destroys polarity in segmentation mitoses of the eggs of both test organisms. Prior to this it inhibits cytokinesis by reducing the activity of the asters which are indispensable for cytokinesis. Trifluralin causes chromosomal abnormalities, especially anomalies of condensation, and makes discontinuities appear at prophase. The local thickenings of metaphase chromosomes predominate in heterochromatic regions. The effect is greater in the animal hemisphere than in the vegetative hemisphere of the egg; this difference is highly significant.

78-2378. Bulger, W. H.; Kupfer, D. (Worcester Found. Exp. Biol., Shrewsbury, MA 01545) **Inhibition of the 1-(*o*-chlorophenyl)- 1-(*p*-chlorophenyl)- 2,2,2-trichloroethane (*o,p'*-DDT)- and estradiol-mediated induction of rat uterine ornithine decarboxylase by prior treatment with *o,p'*-DDT, estradiol, and tamoxifen.** *Arch. Biochem. Biophys.* 182(1): 138-146; 1977. (44 references)

The effects were studied of prior administration of *o,p'*-DDT or estradiol-17β on the elevation of rat uterine ornithine decarboxylase (ODC) caused by *o,p'*-DDT or estradiol-17β in order to determine whether these two substances elicite antiestrogenic effects. Doses of 10 mg/day of *o,p'*-DDT were injected ip for two days to ovariectomized rats and followed one or two days later when levels of ODC returned to basal levels, by injections of 10 mg *o,p'*-DDT or 0.05 μg estradiol-17β. The pretreatment with *o,p'*-DDT almost entirely blocked the induction of ODC by estradiol-17β or *o,p'*-DDT. Pretreatment with *o,p'*-DDT for 5 or 6 days eliminated the induction of ODC after injection of *o,p'*-DDD on day 7. Similarly, treatment of rats with the antiestrogen tamoxifen (0.1 mg/day) for 4 days completely inhibited the subsequent elevation of ODC by either estradiol-17β or *o,p'*-DDT given on the fifth day. Pretreatment with estradiol-17β yielded variable results. In explaining the mechanism of these findings it was considered unlikely that the *o,p'*-DDT and tamoxifen mediated inhibition of ODC induction was due to an increase in hepatic biotransformation of *o,p'*-DDD and estradiol-17β: tamoxifen or estradiol-17β did not induce hepatic microsomal cytochrome P450, and 2,2,-bis-(*p*-chlorophenyl)- 1,1-dichloroethylene, which is not estrogenic but like *o,p'*-DDT elevates hepatic monooxygenase activity, and did not inhibit estradiol-17β or *o,p'*-DDT-mediated induction of uterine ODC. It is suggested that inhibition of ODC elevation after initial induction of ODC by antiestrogens and *o,p'*-DDT is due to putrescine or polyamine mediated inhibition of ODC.

78-2379. Dingle, J. H. P.; Palmer, W. A. (Dep. Agric., Board Tick Control, Lismore, New South Wales, Australia) **Residues of hexachlorobenzene in subcutaneous and butter fat of cattle.** *Aust. J. Exp. Agric. Anim. Husb.* 17(8): 712-717; 1977. (7 references)

The effects of dietary administration of hexachlorobenzene on the accumulation and disappearance of subcutaneous fat residues in steers was examined. Hexachlorobenzene analyses were performed by gas-liquid chromatography. Two-yr-old beef steers were fed 0, 6, 36, or 216 mg of hexachlorobenzene daily for 10 wk. HCB levels in subcutaneous fat at 10 wk were 0, 3.1, 16.25 and 98.75 mg/kg respectively. Experiments showed that HCB fat levels decreased exponentially, with an average half life of 10.5 wk. Animals maintained on a starvation diet for 4 wk showed a reduced rate of HCB elimination. Milk cows were exposed to 0, 1, 6, and 36 mg HCB daily. The uptake of HCB in butterfat was linear, with levels of 0, 0.36, 4.37, and 16.7 mg/kg, respectively. Again, degradation curves were exponential, with an average half life of 6.4 wk. This study should be taken into account in determining residues in cattle sold for slaughter.

78-2380. Young, E. T.; Nicholls, D. M. (Dep. Biol., York Univ., Toronto, Ontario M3J 1P3, Canada) **Liver enzyme induction by 1,1,1-trichloro- 2,2-bis- (*p*-chlorophenyl) ethane (DDT) is accompanied by an increase in the specific activity of elongation factor 1.** *Biochem. J.* 172(3): 477-486; 1978. (52 references)

The amount and activity was assessed of purified elongation factor 1 (EF 1) obtained from the soluble cytosol fraction of rat liver after the induction of membrane proliferation by DDT in order to understand changes occurring in the protein synthetic system during enzyme induction. Postmicrosomal supernatant fractions of liver homogenates from rats given DDT were used for the purification of EF 1 by hydroxyapatite chromatography and phosphocellulose chromatography. The amount of binding factor was the same for both exposed and control animals, but the specific activity was about twice as high in the DDT-treated preparations. Sucrose-gradient sedimentation showed that the difference in specific activity resided in the low-molecular-weight (50,000) form of EF 1. This form is believed to be the species involved in aminoacyl-tRNA binding. It is suggested that factors induced by DDT treatment which lead to an increased reactivity and/or stability of EF 1 are located in the soluble fraction of the cells.

78-2381. Mitchell, J. R.; Nelson, S. D.; Snodgrass, W. R.; Timbrell, J. A. (Lab. Chem. Pharmacol., Natl. Heart Lung Inst. NIH, Bethesda, MD 20014) **Metabolic activation of hydrazines to highly hepatotoxic intermediates.** In: *Biological Reactive Intermediates: Formation, Toxicity and Inactivation.* Jollow, D. J., Kocsis, J. J., Synder, R. and Vainio, H. eds. (New York: Plenum Press): pp. 271-277; 1977. (14 references)

A possible mechanism of hepatotoxicity caused by the tuberculostatic drug isoniazed and related hydrazine

compounds, some of which are used as herbicides, was investigated. From the studies it is postulated that monoacyl and monoalkyl hydrazines are oxidized by cytochrome P450 to *N*-hydroxy intermediates followed by dehydration of the respective diazenes. Studies showing correlations between propane formation and binding to tissue macromolecules suggest that radicals are the proximate reactive species. Another mechanism that cannot be ruled out at present is a second oxidation of the postulated diazene intermediate to form a diazohydroxide. However, kinetic data do not support this possibility for all cases. Whatever the intermediate may be, the findings are clear that metabolic activation, by microsomal enzymes is required to elicit the toxicity of many hydrazine compounds, including the serious and occasionally lethal hepatitis seen with isoniazid and iproniazid therapy.

78-2382. Neal, R. A.; Kamataki, T.; Lin, M.; Ptashne, K. A.; Dalvi, R. R.; Poore, R. E. (Cent. Toxicol., Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN 37232) **Studies of the formation of reactive intermediates of parathion.** In: *Biological Reactive Intermediates: Formation, Toxicity and Inactivation.* Jollow, D. J., Kocsis, J. J., Synder, R., and Vainio, H. eds. (New York: Plenum Press): pp. 320-332; 1977. (23 references)

Current knowledge about the mixed-function oxidase catalyzed metabolism of parathion is discussed. Evidence is presented indicating that reactive intermediates formed in the mixed-function oxidase catalyzed metabolism of parathion *in vitro* bind covalently to the endoplasmic reticulum and more particularly to cytochrome P450, resulting in inhibition of the reactions catalyzed by this enzyme. Principal emphasis was placed on the chemical mechanism of the mixed-function oxidase catalyzed metabolism of parathion to paraoxon. In order to study the mixed-function oxidase metabolism, cytochrome P450 from the livers of phenobarbital pretreated rabbits and rats was purified to apparent homogenity. The enzyme NADPH-cytochrome *c* reductase from the livers of phenobarbital-pretreated rabbits and rats was also purified for this study. A portion of the sulfur bound to proteins in a reconstituted mixed-function oxidase enzyme system from rat liver which had been incubated with [^{35}S]-parathion followed by cyanide was indentified as a hydrodisulfide. The hydrodisulfide may be responsible for part or all of the inactivation of cytochrome P450 in this test system.

78-2383. O'Brien, T. E.; McManus, C. E. (Mary Imogene Bassett Hosp., Cooperstown, NY 13326) **Drugs and the fetus: A consumer's guide by generic and brand name.** *Birth Fam. J.* 5(2): 58-86; 1978. (177 references)

The mechanisms of drug transport across the placenta and the difficulties involved in testing for adverse fetal effects of drugs are reviewed. Anti-infective agents, cancer chemotherapy agents, hematologic drugs, cardiovascular drugs, hormones, anaesthetics, vaccines, vitamins, and others are described. Of hematologic drugs, bishydroxycoumarin causes greater anticoagulant effect in the fetus than in the mother, leading to hemorrhage, death in utero, and fetal deformities. Arsenic trioxide, used in a suicide attempt during the last trimester, caused infant death and the infant was found to have high levels of the chemical in the brain, kidney, and liver. Exposure to organic mercury compounds can cause blindness and nervous system malformations such as cerebral palsey and mental retardation. Polychlorinated biphenyls can cause a staining of the skin and mucous membrances as well as growth retardation.

78-2384. Netter, K. J.; Steffen, C. (Dep. Pharmacol. Sch. Med., Univ. Marburg, D-3550 Marburg/Lahn, Germany) **Paraquat-induced formation of hydroperoxide in mouse liver microsomes.** *Br. J. Pharmacol* 63(2): 351p, 353p; 1978. (7 references)

To study the effects of paraquat on the biochemistry of mouse liver microsomes, the microsomes were incubated at 37°C with NADPH and an NADPH regenerating system; oxygen uptake and malondialdehyde (MDA) formation were measured. Paraquat increased oxygen uptake in a dose dependent fashion, and MDA formation was decreased by paraquat. Normally 1 mole of NADPH is oxidized/mole of oxygen, but in the presence of 1 m*M* paraquat, the ratio was 2. H_2O_2 was found to be the direct reduction electron transport chain from the flavoproteins to oxygen, thereby keeping the flavoproteins in the oxidized state and inhibiting the mixed function oxidations. [Presented at the 1978 meeting of the British Pharmacological Society.]

78-2385. Wurtsbaugh, W. A.; Apperson, C. S. (Div. Wildl. Fish. Biol., Univ. California, Davis, CA 95616) **Effects of mosquito control insecticides on nitrogen fixation and growth of blue-green algae in natural plankton associations.** *Bull. Environ. Contam. Toxicol.* 19(6): 641-647; 1978. (18 references)

The effects of five mosquito control agents on nitrogen fixation and growth of blue-green algae in natural plankton associations were studied. After three to six days, temephos, methoxychlor and the high dosages of methoprene and propoxur significantly stimulated nitrogen fixation rates of the algae. Final fixation rates in the high concentration of temephos were nearly 500% of control. The nitrogen fixation rate in the high concentration of methoprene was over 900% of control. In several cases increased nitrogen fixation was accompanied by small but significant increases in chlorophyll *a*. Analysis indicated that nitrogen fixation rates were most strongly correlated with *Aphanizomenon* heterocyst concentrations. Mean nitrogen fixation rates in treatments receiving Dimilin (diflubenzunon) and the low dosage of methoprene were lower than in controls. Regardless of whether pesticides acted directly on the algae or indirectly through actions on other organisms, this study indicates that normally used dosages of pesticides can markedly affect nitrogen fixation rates and growth of blue-gree algae, and consequently the nitrogen flow in aquatic systems. The significance of this effect depends on the particular aquatic habitat to which the pesticides are applied.

78-2386. Somers, J. D.; Moran, E. T., Jr.; Reinhart, B. S. (Dep. Anim. Poultry Sci., Univ. Guelph, Guelph, Ont. N1G 2W1, Canada) **Influence of hen dietary calcium and phosphorus on the integrity of the egg shell as it would influence hatching success and the consequences of preincubation 2,4,5-T spraying with and without a high TCDD level.** *Bull. Environ. Contam. Toxicol.* 19(6): 648-654; 1978. (14 references)

The effect of altering hen calcium and phosphorus nutrition on incubation performance of weakened egg shells, and the consequences of spraying 2,4,5-T with various concentrations of TCDD were studied. Commercial strain laying hens were fed practical rations deficient in calcium and/or phosphorus to affect weak-shelled eggs. Spraying of these eggs prior to incubation with 2,4,5-T preparations containing various amounts of TCDD contamination at 10 times the recommended levels did not have any effect on any of the parameters used to evaluate embryological development. Neither was subsequent early performance of resultant chicks affected. Analyses for 2,4,5-T residues indicated that the shell, even though weakened, was not affected as a barrier to herbicide contamination.

78-2387. Roszkowski, J.; Zadura, J. (Vet. Res. Inst., Pulawy, Poland) **The effect of lindan [sic] on immune response in chickens.** *Bull. Vet. Inst. Pulawy* 20(3-4): 88-91; 1976. (12 references)

To study the effects of lindane on immune responses, chickens were immunized intravenously with sheep red blood cells. They were then given 50 mg/kg lindane in a single dose 1, 2, or 3 days after immunization or 20 mg/kg daily for 48 days, and hemolysins and hemagglutinins were determined. The chickens that had received the single sublethal dose showed signs of intoxication, and 10 to 20% of them died; however, none showed any significant differences in immunological indices compared to controls. The chickens that had received lindane for 48 days had immunologic indices and absolute spleen weights lower than the controls, but the differences were not significant. The results indicate that lindane does not influence hemolysin or hemagglutinin production in either acute or chronic poisoning. The number of splenic germinal centers was also unchanged by lindane treatment.

78-2388. Braun, R.; Schoeneich, J.; Ziebarth, D. (Zentralinst. Genet. & Kulturpflanzenforsch., Akad. Wiss. DDR, DDR-4325 Gatersleben, DDR) ***In vivo* formation of *N*-nitroso compounds and detection of their mutagenic activity in the host-mediated assay.** *Cancer Res.* 37(12): 4572-4579; 1977. (58 references)

The mutagenic activity of *N*-nitroso compounds in mouse stomach was measured in the ip host-mediated assay, using *Salmonella typhimurium* TA1950 as the genetic indicator system. The *N*-nitroso compounds were formed from equimolar doses of sodium nitrite and secondary amines or alkylurea derivatives given simultaneously by stomach tube. After the administration of the cyclic amines piperazine dihydrochloride, morpholine, and amitrole, a mutagenic response in the bacteria was found. Highest mutagenicity was exerted by piperazine dihydrochloride plus nitrite, while amitrole plus nitrite was only weekly mutagenic. No mutagenic activity was noted for equimolar doses of sodium nitrite plus dimethylamine hydrochloride, diphenylamine, methylbenzylamine hydrochloride, and phenmetrazine hydrochloride. All *N*-alkylurea derivatives tested yielded significant amounts of *N*-nitroso compounds, which allowed detection of their mutagenic activity in the host-mediated assay. Nitrite plus ethylenebis (thiourea) showed the highest activity, while methylurea and ethylurea were less active in combination with nitrite. Dose-response curves for the mutagenic activity of *N*-nitrosamines were used to estimate the amounts of *N*-nitroso derivatives formed *in vivo* from the precursors after acute treatment of the mice. In the case of piperazine dihydrochloride, a nitrosation rate of 50 to 70% was noted, while for morpholine nitrosation ranged from 1 to 3%. Long-term carcinogenesis studies with sodium nitrite plus amines are compared.

78-2389. Bezbaruah, B. (Reg. Res. Lab., Jorhat, India) **A discussion on the possibilities of biodegradation of certain chemicals used or obtained during the manufacture of some pesticides.** *Chem. Age India* 27(12): 1065-1073; 1976. (53 references)

Following a discussion of the fundamental concepts of biodegradation, the toxicity of pesticides is discussed in relation to chemical structure, properties and biochemical reactions. Tables list sources of environmental contamination by pesticides, criteria which usually influence the biocidal properties of chemicals and compounds obtained from by-product isomers of benzene hexachloride (BHC). The synthesis and microbial metabolism of eight pesticides currently being manufactured in India or approved for registration are illustrated in structural representations. These include paraquat, lindane, dieldrin, malathion, carbaryl, phosphamidon and zineb. Detoxication reactions of toxic chemicals in the environment are briefly discussed, including dehalogenation, dealkylation, amide or ester hydrolysis, oxidation, reduction, ester fission, aromatic ring hydroxylation and ring cleavage.

78-2390. Engelhardt, G.; Wallnofer, P. R. (Abt. Pflanzenschutz, Bayerische Landesanst. Bodenkult. & Pflanzenbau D-8000 Munich 19, Germany) **Microbial transformation of the triazinone herbicide metamitron to desaminometamitron.** *Chemosphere* 7(6): 463-466; 1978. (6 references)

The desamination of metamitron, a 1,2,4-triazinone herbicide used in sugarbeet crops, by pure culture of bacteria and fungi is examined. If the microorganisms were provided with a second source of carbon other than the metamitron, the metamitron was metabolized to desaminometamitron. The rate of formation of this metabolite varied between organisms. *Arthrobacter*- and *Pseudomonas*-strains transformed approximately 20 to 40% of the metamitron to desaminometamitron within 2 wk; the fungi *Rhizopus japonicus* and *Cunninghamella echinulata* Thaxter transformed more than 60% of metamitron to the metabolite within the same period of time.

78-2391. Bairova, A.; Vulcheva, V. (Inst. Hyg. & Occup. Dis., Med. Acad., Sofia, Bulgaria) **Lung changes after chronic paraquat intoxication.** *C. R. Acad. Bulg. Sci.* 30(12): 1287-1290; 1977. (11 references)

To study the effects of chronic treatment of paraquat on the lungs, experimental animals were given 1.3 mg/kg paraquat daily for 12 and 24 mo, or 2.6 mg/kg daily for 24 mo. Body weights, behavior, general conditions, and death rates were assessed, and livers, myocardia, and kidneys were also investigated. Animals treated with paraquat had significantly higher death rates than controls. No visible tumors were found. The lungs of treated animals showed marked inflammation and there were indications of peeling of the bronchial epithelium. Glandular growths were observed in treated animals resembling pulmonary adenomatosis. Dystrophy of the parenchymal cells was observed in other organs.

78-2392. Skujins, J. (Ecol. Cent., Utah State Univ., Logan, UT) **Extracellular enzymes in soil.** *Crit. Rev. Microbiol.* 4(4): 383-421; 1976. (331 references)

The advances in soil enzymology in the last decade are considered in this review. It is mentioned that one area of present research is concerned with studying functions of extracellular enzymes in soil and their interactions with herbicides, fungicides and insecticides. It is also mentioned that a number of studies have been devoted to pesticide degradation by soil enzymes and to pesticide effects on extracellular enzyme activities in soils. Reference is made to a review of this area.

78-2393. Shabarchin, E. I.; Kruglyakova, K. E.; Gendel', L. Ya. (Inst. Chem. Phys., Acad. Sci. USSR, M. V. Lomonosov Moscow State Univ., Moscow, USSR) **Possibility of using biological membranes as models for evaluating the biological activity of pesticides.** *Dokl. Biochem.* 234(1-6): 161-163; 1977. (4 references)

English translation; for abstract of original Russian article see *Pesticides Abstracts* No. 77-2748.

78-2394. Atlavinyte, O.; Daciulyte, J.; Lugauskas, A. (Inst. Zool. Parasitol., Vilnius, USSR) **The effect of Lumbricidae on plant humification and soil organism biocenoses under application of pesticides.** *Ecol. Bull.* 25: 222-228; 1977. (11 references)

The effects were studied of TCA, sevin (carbaryl), simazine and dipterex (trichlorfon) on the activity of intact and injured earthworms as well as on the survival of these soil animals. Additional studies were conducted on effects of pesticides on plant humification and densities of Acarina, Collembola, and microorganisms. In addition, the accumulation of vitamin B_{12} in the soil under the above conditions was investigated. The pesticides had no marked effect on the survival of intact and amputated earthworms in fertilized soil contained in pots, although they inhibited earthworm activity to some degree during plant humification. The effect of pesticides on the densities of Acarina and Collembola in the layer of decomposing plants was variable. The smallest number of these organisms were found in the layer of *Agropyron* in the studies with TCA. The yield of barley increased two-fold in soil fertilized with chopped plants. It increased by 62-269% when intact earthworms were present in the soil compared to conditions without earthworms. The barley yield increased by 40-59% when injured earthworms were present. Plant humification proceeded at a higher rate in studies with both intact and injured earthworms than in the studies without earthworms. The amount of vitamin B_{12} and microorganisms was greater in studies with earthworms than in those without them.

78-2395. Robinson, H. J.; Phares, H. F.; Graessle, O. E. (Merck, Sharp & Dohme Res. Lab., Rahway, NJ 07065) **The toxicological and antifungal properties of thiabendazole.** *Ecotoxicol. Environ. Saf.* 1(4): 471-476; 1978. (14 references)

Thiabendazole is a white crystalline compound which has usefulness against many genera of fungi causing plant disease. The compound is readily absorbed by the roots and translocated to all parts of the plant. The compound is effective in the control of a large number of plant diseases affecting fruits, nuts, vegetables, field crops, ornamentals, and turf. Thiabendazole is used for seed treatment to control growth of *Cercosporella herpotrichoides, Fasarium culmorum, F. nivale, F. oxysporum, F. roseum, F. solani, Erysiphe graminis, Helminthosporium sativum,* and *Ustilago avenae.* Thiabendazole is well tolerated by all animal species tested to date. Thiabendazole is rapidly absorbed from the gastrointestinal tract and reaches peak plasma concentrations of 13-18 μg/ml 1 hr after administration. The compound undergoes biotransformation in the liver by hydroxylation and subsequent conjugation to the glucuronide and sulfate. The compound is rapidly excreted by the kidney, with 92% of the administered radioactivity appearing in the urine and feces within 48 hr. The bulk was in the urine within 24 hr. Tests in mice and rabbits revealed no apparent teratogenic effects of thiabendazole.

78-2396. Wright, A. S.; Donninger, C.; Greenland, R. D.; Stemmer, K. L.; Zavon, M. R. (Shell Toxicol. Lab., Sittingbourne Res. Centre, Shell Res. Ltd. Sittingbourne, Kent ME9 8AG, England) **The effects of prolonged ingestion of dieldrin on the livers of male rhesus monkeys.** *Ecotoxicol. Environ. Saf.* 1(4): 477-502; 1978. (58 references)

Biochemical aspects of a wide-ranging study of the effects of long term exposure of male rhesus monkeys to dieldrin at dietary concentrations of 0.01 to 5 ppm are presented. Exposure lasted 6 yr. The overall study revealed no effects that could be attributed to dieldrin apart from slight changes associated with the hepatocellular endoplasmic reticulum. Increases in the activity of the liver microsomal monooxygenase system provided the most sensitive criteria for an effect. Significant increases were noted in the 1.75 to 5 ppm treatment groups. Increases in monooxygenase activity paralleled those in cytochrome P450 activity. No effect was noted on glucose 6-phosphatase. No significant effects on liver weight

nor on the DNA content of the liver were seen. Concentrations of dieldrin in tissues of the 0.1 ppm treated monkeys were similar to those measured in humans receiving a similar dietary intake of dieldrin. Concentrations of dieldrin in livers of the monkeys were, however, 200 times higher than in male rats receiving a 2 times greater daily intake of dieldrin. The results obtained with rhesus monkeys, and the absence of any detectable changes in the livers of humans exposed to high endogenous concentrations of dieldrin, suggest a slow rate of metabolic clearance of dieldrin in these primate species and a low sensitivity of their livers to this compound.

78-2397. Butler, W. H. ; Jones, G. (Dep. Histopathol., St. George's Hosp. Med. Sch., London SW17 0QT, England) **Pathological and toxicological data on chlorinated pesticides and phenobarbital.** *Ecotoxicol. Environ. Saf.* 1(4): 503-509; 1978. (19 references)

Assessing data on pathological and toxicological properties of chlorinated pesticides and phenobarbital from animal studies must be done in distinct stages: assessment of individual animals; assessment of groups of exposed animals within the experimental protocol; and extrapolation to man. The assessment of individual animals is the main tmeme of this report. Many of the detailed studies of organochlorine pesticides have been undertaken in the mouse; most often studied was DDT. From the published data on DDT it cannot be concluded that this compound has been demonstrated to be a hepatocarcinogen. Most chlorinated pesticides produce a similar range of lesions in the mouse, and this forms a basis for classifying them as carcinogens. A careful study of lesions induced by dieldrin in the CF-1 mouse is discussed. It is noted that if the histological pattern is significant in determining which of the lesions seen in the mouse represents neoplasia and which a reactive hyperplasia then it is unfortunate that this criterion cannot be applied when assessing any of the published data on the carcinogenicity of chlorinated pesticides. On the basis of available data it is suggested that one should hesitate in stating that chlorinated pesticides are carcinogenic for the mouse liver. With the exception of Aramite there is little well founded data on the carcinogenicity of organochlorine pesticides in other species.

78-2398. Iatropoulos, M. J.; Bailey, J.; Adams, H. P.; Coulston, F.; Hobson, W. (Int. Cent. Environ. Saf., Albany Med. Coll., PO Box 1027, Holloman AFB, NM 88330) **Response of nursing infant rhesus to Clophen A-30 or hexachlorobenzene given to their lactating mothers.** *Environ. Res.* 16(1-3): 38-47; 1978. (16 references)

Clophen A-30 or hexachlorobenzene (HCB) were given daily by gavage to lactating rhesus monkeys to determine any responses that are different from the adults. A dose of 16 mg of Clophen A-30/kg was given to two animals for 29 days and to another for 22 days. Their infants at sacrificing were 112, 149 and 68 days old, respectively. Three other animals received 64 mg of HCB/kg for 22, 38 and 60 days. Their infants were 140, 99 and 81 days old, respectively, when necropsied. For those given Clophen A-30, degenerative changes of slight to moderate severity in the liver were seen such as centrolobular karyopycnosis and vesiculation as well as vacuolation and dilation of the proximal tubules in the kidneys and demyelination, cerebellar granular layer thinning and reactive gliosis in the central nervous system. One mother and her infant in the Clophen group became ill. Two infants receiving HCB died. The HCB infants showed only mild degenerative changes in the kidney such as vacuolation of the proximal tubes and centrolobular hypertrophy and fatty metamorphosis in the liver. Alterations in HCB treated adults were substance-specific. Mean serum HCB concentrations in infants at sacrifice were higher than serum HCB concentrations in the mothers. HCB levels in the milk were very high. Nursing infant rhesus monkeys seemed to be less susceptible to Clophen A-30 and HCB than adults.

78-2399. Gellert, R. J. (Dep. Obstet. & Gynecol., Sch. Med., Univ. Washington, Seattle, WA 98195) **Kepone, mirex, dieldrin, and aldrin: estrogenic activity and the induction of persistent vaginal estrus and anovulation in rats following neonatal treatment.** *Environ. Res.* 16(1-3): 131-138; 1978. (26 references)

Polycyclic hydrocarbon insecticides known to adversely affect the reproductive function were tested in weanling rats for uterotrophic activity, which was correlated with the capacity of these insecticides to induce the persistent vaginal estrus syndrome and anovulation. Kepone (chlordecone) produced significant uterine growth 24 hr after subcutaneous injection of 10 and 100 mg/kg; the lowest dose, 1 mg, had no effect. Aldrin and dieldrin at doses up to 1000 mg/kg and mirex at doses up to 100 mg/kg had no uterotrophic activity. Following neonatal treatment, only Kepone induced precocious vaginal opening, persistent vaginal estrus and anovulation. A dose of 0.2 mg of Kepone produced the persistent vaginal estrus in 6 mo, whereas a 1.0 mg dose produced it by 4 mo of age. Aldrin, dieldrin and mirex did not induce persistent vaginal estrus following neonatal treatment. It is concluded that the capacity of Kepone to induce persistent vaginal estrus and anovulation is probably related to its estrogenic activity, and conversely, by the failure of the other pesticides to do so, to their lack of estrogenic activity.

78-2400. Wakakura, M.; Ishikawa, S.; Uga, S. (Dep. Ophthalmol., Div. Toxicol., Sch. Med., Kitasato Univ., Sagamihara, Kanagawa, Japan 228) **Ultrastructural hepatic changes by carbamate pesticide (Sevin) in rats.** *Environ. Res.* 16(1-3): 191-204; 1978. (31 references)

Ultrastructural and related biochemical changes produced by Sevin (carbaryl) were studied in livers of adult male rats as a contribution to the toxicology of carbamate pesticides in mammalian liver. A single 30 mg oral dose or 50 3 mg doses over 1 yr were given to rats with an average body weight of 200 g. A schedule of 3 hr of feeding followed by 21 hr of fasting was strictly controlled. In those given the single dose, blood glucose was reduced at 20 hr and elevated at 44 hr after administration, whereas immunoreactive insulin was elevated at both times particularly at 44 hr, especially

the latter. In rats given the 50 dose regimen, blood glucose was elevated and immunoreactive insulin was slightly reduced 60 days after termination of the treatment. Glycogen disappeared in most of the hepatocytes. The cells contained predominantly dilated granular endoplasmic reticulum with swollen mitochondria. Thus, both in the long term and acute studies hepatic glycogen metabolism was affected by Sevin.

78-2401. Meena, K.; Gupta, P. K.; Bawa, S. R. (Dep. Biophys., Punjab Univ., Chandigarh, India) **Endrin-induced toxicity in normal and irradiated rats.** *Environ. Res.* 16(1-3): 373-382; 1978. (17 references)

Enzymatic changes produced by a single ip dose of endrin (10 mg/kg) given to normal and irradiated rats (900 rads) was studied to help remedy the lack of information concerning the effects of chlorinated hydrocarbon insecticides on mammalian biochemical functions and to aid in understanding their mechanisms of action. Endrin caused a significant increase in serum glutamic oxaloacetic transaminase, glutamic pyruvic transaminase and adenosine triphosphatase; acid and alkaline phosphatase, succinic dehydroganase and glucose 6-phosphatase decreased significantly during varying periods of 2 to 48 hr after treatment. In irradiated rats given endrin, the changes appeared earlier and were more pronounced than in normal rats and those given endrin alone. As with other toxic substances, endrin is thus shown to produce tissue injury and affect aerobic and anaerobic metabolism of glucose in liver and kidney tissues. It also appears to enhance the effects of radiation, except in the case of adenosine triphosphatase, where it neutralizes radiation effects on the mitochondrial membrane.

78-2402. Tsakas, S. C. (Dep. Genet., Agric. Coll. Athens, Athens, Greece) **Genetics of *Dacus oleae*. VIII. Selection for the amount of acetyl cholinesterase after organophosphate treatment.** *Evolution* 31(4): 901-904; 1977. (5 references)

The possibility of selection operating in nature on the polymorphism of locus A in the adult olive fruit fly *Dacus oleae* Gmel was investigated. Samples were taken from a natural population (Aghii Apostoli, Greece) before and after organophosphate treatment. The change in gene frequency after organophosphate treatment was explainable by random drift and did not necessitate the implication of selection. Further examination was made of several populations from the Mediterranean basin to determine whether populations under continuous organophosphate treatment have a lower frequency of silent alleles and a higher frequency of duplications of the A locus than populations that were not treated by organophosphates. This survey indicated that control of the olive fruit flies by organophosphates selects for an increased dosage of the gene acetyl cholinesterase A, resulting in an elevation of the insect's resistance to this group of insecticides.

78-2403. Uppal, R. P.; Ahmad, A. (Haryana Agric. Univ., Hissar 125004, India) **Blood cholinesterase and serum transaminases in malathion toxicity in buffalo calves.** *Indian J. Anim. Sci.* 47(10): 636-639; 1977. (14 references)

Correlation between blood cholinesterase and serum transminase activity was investigated. Twelve buffalo calves were exposed to acute and subacute toxic doses of malathion at levels of 100, 50, and 20 mg/kg. Marked symptoms of toxicity occurred in some animals. In these animals the maximum depression of whole blood cholinesterase was 38.7 and 21.3% after a single oral dose of 100 and 50 mg/kg, respectively. Daily po administration of 20 mg/kg for 21 days also caused toxic symptoms, but the whole blood cholinesteras activity was depressed only 17.6%. Serum transaminase activity was increased in all groups. The increase in serum transaminase levels was less marked with the dose of 50 mg/kg than it was with 100 mg/kg. At a dose of 20 mg/kg the increase in serum glutamic oxaloacetic transaminase (SGOT) was especially noted. It is suggested that blood cholinesterase and SGOT activity may be useful in assessing toxicity to animals.

78-2404. Ahamad, I. K.; Rao, K. V. S.; Swami, K. S. (Dep. Zool., Sri Venkateswara Univ., Tirupati 517502, India) **Effect of malathion on enzyme activity in foot, mantel and hepato pancreas of snail *Pila globosa*.** *Indian J. Exp. Biol.* 16(2): 258-260; 1978. (14 references)

Metabolic effects of malathion in a garden snail *Pila globosa* was investigated. The snails were exposed to malathion at concentrations of 5, 10, 15, 20, 25, and 30 ppm. The 10 ppm dose represented the median lethal dose, while 30 ppm was totally lethal. Malathion at 5 ppm in 4 l of water was found to be in the safe range. Subsequent experimentation was performed at this level. Acetyl cholinesterase activity was inhibited in snails exposed to this concentration, while the activities of aspartate and alanine amino transferases were enhanced with a concomitant decrease in total free amino acid. The increase in amino transferase activities in malathion exposed snails suggests that feeding of amino acids into the TCA cycle is elevated. However, the decrease in total free amino acid content in malathion exposed snails indicates a rapid depletion of these amino acids as a consequence of elevated AAT and AlAT activites.

78-2405. Edwards, J. P.; Rowlands, D. G. (Minist. Agric., Fish. & Food, Pest Infest. Control Lab., Slough, Berks, England) **Metabolism of synthetic juvenile hormone (JH-1) in two strains of the grain weevil, *Sitophilus granarius*.** *Insect Biochem.* 8(1): 23-28; 1978. (24 references)

The metabolism of synthetic juvenile hormone (JH-1) was investigated in pupae and adults of insecticide-susceptible and insecticide resistant strains of *Sitophilus granarius*; the effects of synergists on the penetration and metabolic degradation of JH-1 was also studied. Adults of both strains metabolized JH-1 to form the 10.11-diol derivative, the 1-carboxy acid derivative, the corresponding acid-diol derivative, and some unidentified water-soluble derivatives. Adults of the susceptible strain tended to produce more of the 1-carboxyacid derivative, whereas the adults of the pyrethrin resistant strain tended to produce more of the acid-diol derivative. Pretreatment with the synergist piperonyl butox-

ide or SKF 525A caused both strains to produce 1-carboxyacid as the major metabolite of JH-1, and also decreased the rate of metabolism in both strains.

78-2406. Ilan, Z.; Yaron, Z. (Dep. Zool., George S. Wise Cent. Life Sci., Tel Aviv Univ., Tel Aviv, Israel) **Suppression of interrenal function of *o,p'*-DDD in *Tilapia aurea* (Teleostei: Cichlidae).** *Israel J Zool* 26(3/4): 265-266; 1977.

This abstract reports the effects of *o,p'*-DDD (TDE) on cortisol regulation in *Tilapia aurea* as part of a study on the interference of organochlorines in interrenal function of this fish. The kinetics of cortisol release were different in superfused interrenals taken from *o,p'*-DDD treated fish (50 ppm for 24 hr) as compared with those of untreated controls. The baseline in superfused interrenals from treated fish remained comparatively high as compared with the exponential decrease during the first 90 min in controls. Also, the response to ACTH after 5 hr was only marginal in the treated fish when compared to the prompt increase in the cortisol secretion rate in the controls. The resting level of plasma cortisol 24 hr after the injection of *o,p'*-DDD increased to 155 ± 13 ng/ml, and failed to increase further during stress in contrast to control resting values of 87 ± 11 ng/ml and stress values of 165 ± 11 ng/ml. These results parallel those of the superfusion both in the elevated resting level of the treated fish and in the ability of the interrenal tissue to respond to endogenous ACTH. Finally, cortisol metabolism was lower in the liver of *o,p'*-DDD- treated fish as compared with that of controls.

78-2407. Golovleva, L. A.; Golovlev, E. L.; Zyakun, A. M.; Shurukhin, Yu. V.; Finkelstein, Z. I. (Inst. Biochem. & Physiol. Microorg., Acad. Sci. USSR, Pushchino, USSR) **Metabolism of Ordram - a thiocarbamate herbicide by microorganisms.** *Izv. Akad. Nauk USSR, Ser. Biol.* (1): 44-51; 1978. (11 references) (Russian)

Microbial cultures from natural waters were studied to determine their ability to decompose the herbicide Ordram (molinate). Twenty microbe strains, most being pseudomonads, and the rest composed of nocardia, mycocci, and bacilli, were capable of metabolizing ordram in the presence of additional substrates. The effective substrates included ethanol (for pseudomonads) sucrose (for cocci and bacilli), xylose and glucose. Ineffective substrates included sodium benzoate, glycerol, and sucrose (for pseudomonads). The rate and magnitude of Ordram decomposition varied from culture to culture. Most microbial cultures degraded the Ordram into a partially oxidized product which accumulated in the medium. Initial by-products of ordram were studied by mass-spectrometry and by thin-layer and gas-liquid chromatography.

78-2408. Benezet, H. J.; Knowles, C. O.*; Campbell, J. R.; Savage, J. E. (Dep. Entomol., Univ. Missouri, Columbia, MO 65201) **Excretion balance, metabolic fate, and tissue residues following treatment of lactating goats and laying hens with thidiazuron cotton defoliant.** *J. Agric. Food Chem.* 26(3): 622-627; 1978. (3 references)

Thidiazuron (*N*-phenyl-*N'*-1,2,3-thiadiazol- 5-ylurea) cotton defoliant was administered for 10 consecutive days to lactating goats and laying hens. The vast majority of the radioactive material (> 70%) was eliminated in goat urine and feces; less than 1.5% of the administered radioactivity was in the milk. Hens excreted 72% of the total consumed radioactive material during the 10-day feeding period. In addition to the parent compound, which was present in low levels in goat milk and in chicken excreta, eggs, liver, and kidney, *N*-4-hydroxyphenyl- *N'*-1,2,3-thiol-5- ylurea or 4-hydroxyphenyl thidiazuron and phenylurea were detected. 4-Hydroxyphenyl thidiazuron was the major thidiazuron metabolite and was present in the free and/or conjugated form in goat and hen excreta, milk, eggs, and certain tissues. Phenylurea was detected only in goat urine. Other unidentified compounds also were present. (Author abstract reprinted by permission of the American Chemical Society)

78-2409. Harvey, J., Jr.; Han, J. C. Y. (Biochem. Dep., Res. Div., Exp. Stn., E. I. duPont de Nemours & Co. Inc., Wilmington, DE 19898) **Metabolism of oxamyl and selected metabolites in the rat.** *J. Agric. Food Chem.* 26(4): 902-910; 1978. (6 references)

The metabolism of oxamyl and of its principal plant metabolites, methyl *N',N'*-dimethyl-*N*-[1-glucosyl)oxyl]-1-thiooxamimidate (metabolite A) and *N,N*-dimethyl-1- cyanoformamide (DMCF), was investigated by incubation with rat liver microsomes and by oral administration to preconditioned rats. Oxamyl was degraded by two major pathways: hydrolysis to the oximino compound (I), or enzymatic conversion via DMCF to *N,N*-dimethyloxamic acid (III). Conjugates of I, III, and the monomethyl derivatives II, IV in urine and feces were the major (> 70%) elimination products. No oxamyl or other organosoluble metabolites were detected in urine, feces, or tissues. The incorporation of ^{14}C into normal amino acids accounted for most (> 50%) of the radioactivity retained in tissues. Metabolite A was somewhat resistant to degradation, 30% of the dose being eliminated unchanged while the remaining ^{14}C was converted to the same conjugates obtained from oxamyl. DMCF was degraded and eliminated mainly as conjugates of III and IV. (Author abstract reprinted by permission of the American Chemical Society)

78-2410. Ruzo, L. O.; Unai, T.; Casida, J. E. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Decamethrin metabolism in rats.** *J. Agric. Food Chem* 26(4): 918-925; 1978. (20 references)

On oral administration to male rats, the pyrethroid insecticide decamethrin [(*S*)-α-cyano-3- phenoxybenzyl (1*R*,3*R*)-*cis*-3- (2,2-dibromovinyl)-2,2- dimethylcyclopropane carboxylate] and various metabolites derived from its acid and alcohol fragments are almost completely eliminated from the body within 2-4 days. Metabolites of the cyano substituent are eliminated more slowly, especially from the skin and

stomach, due in the latter case to temporary retention of thiocyanate which is formed from released cyanide. The excreted metabolites include: esters monohydroxylated at the 2′, 4′, and 5 positions of the alcohol moiety; 2,2-dimethyl-3-(2,2-dibromovinyl) cyclopropane carboxylic acid and its glucuronide and glycine conjugates and a hydroxylated derivative of this acid, with the hydroxymethyl group trans to the carboxyl, and its glucuronide; 3-phenoxybenzoic acid and its glucuronide and glycine conjugates, 3-(4′-hydroxyphenoxy) benzoic acid and its glucuronide and sulfate conjugates, and 3-(2′-hydroxyphenoxy) benzoic acid sulfate; thiocyanate and 2-iminothazolidin-4- carboxylic acid. The trans isomer of decamethrin is also rapidly metabolized in rats. (Author abstract by permission of the American Chemical Society)

78-2411. Akhtar, M. H. (Anim. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ont. K1A 0C6, Canada) ***In vitro* metabolism of desmethyl tetrachlorvinphos by soluble fraction (105,000*g*) from chicken liver homogenates.** *J. Agric. Food Chem.* 26(4): 932-935; 1978. (12 references)

The metabolism of desmethyl tetrachlorvinphos [2-chloro-1-(2,4,5-trichlorophenyl) [^{14}C]vinyl methyl hydrogen phosphate] was investigated in vitro with the soluble fraction (105,000*g*) from chicken liver homogenates. The primary step in the metabolism was associated with the enzymatic hydrolysis to yield 2,4,5-trichlorophenacyl chloride. The hydrolytic metabolite was rapidly metabolized to 2,4,5-trichloroacetophenone, 1-(2,4,5-trichlorophenyl) ethanol, and 2-chloro-1- (2,4,5-trichlorophenyl) ethanol. The soluble fraction was shown to contain hydrolase, reductase, and GSH-dependent reductive dechlorinase. (Author abstract reprinted by permission of the American Chemical Society)

78-2412. Mendoza, C. E.; Collins, B. T.; Shields, J. B.; Laver, G. W. (Bureau Chem. Saf., Food Dir. Health Protect. Branch, Natl. Health Welfare, Ottawa, Ont. K1A 0L2, Canada) **Effects of hexachlorobenzene or hexabromobenzene on body and organ weights of preweanling rats after a reciprocal transfer between the treated and control dams.** *J. Agric. Food Chem.* 26(4): 941-945; 1978. (22 references)

The effects of hexachloro benzene (HCB) or hexabromo benzene (HBB) on body and organ weight of preweanling Wistar rat pups after a reciprocal transfer between control and HCB- or HBB-fed dams were studied. A significant increase in the liver weight over the control was observed on pups nursed by dams fed HBB- or HCB-treated diet. Based on body and organ weight, no significant difference ($p > 0.05$) was observed between pups born to HCB- or HBB-fed dams and nursed by dams and those nursed entirely by control dams. In the HBB groups, there was no significant difference between the control and treated pups in terms of brain, heart, kidney, and spleen weights. In the HCB groups, however, the treated pups generally had smaller brain, heart, kidney, and spleen than the controls. The results show that HCB- or HBB-treatment of the nursing mother had greater effects than the treatment of the natural mother. Furthermore, the results indicated that transmission of these compounds through milk had greater effects on pup liver weights than the placental transmission. (Author abstract reprinted by permission of the American Chemical Society)

78-2413. Smrek, A. L.; Adams, S. R.; Liddle, J. A.; Kimbrough, R. D. (Toxicol. Branch, Bur. Lab., CDC, PHS, HEW, Atlanta, GA 30333) **Pharmacokinetics of mirex in goats. 2. Residue tissue levels, trans-placental passage during recovery.** *J. Agric. Food Chem.* 26(4): 945-947; 1978. (12 references)

Male and female goats were given 1 mg of mirex/kg of body weight for 61 wk, followed by 10 mg of mirex/kg body weight to the female for 4 wk. Thereafter, mirex levels in adipose tissue and blood were determined at intervals over a 52-wk recovery period for the males and a 34-wk recovery period for the females. An additional group of female goats was given 1 mg of mirex/kg of body weight for 18 wk and 10 mg of mirex/kg of bodyweight for 4 wk thereafter. Mirex levels in adipose tissue and blood were determined in these goats at intervals over a 52-wk recovery period. During the 34- and 52-wk recovery periods, the mirex levels in adipose tissue decreased to half their original value in female goats and in male goats after a 52-wk recovery period to about a third of their original value. The proportional decrease in mirex plasma concentrations was much greater than in adipose issue. At the end of the recovery period on autopsy, mirex was also present in brains and livers of the adult goats and in fetuses of early gestational age. (Author abstract reprinted by permission of the American Chemical Society)

78-2414. Prabhakar, J. M.; Fraumeni, J. F. (Author address not given) **Possible relationship of insecticide exposure to embryonal cell carcinoma.** *J. Am. Med. Assoc.* 240(3): 288; 1978. (3 references)

Two cases of embryonal cell carcinoma are presented in this note, both of which appear to be related to carbaryl, parathion, Lanate (methomyl), and dimethoate exposure on the job. One man suceeded the other in a job at a canning plant. The first man had a radical orchiectomy after being hospitalized for a right testicular mass. The second worker on the job had no testicular mass, but did have metastatic embryonal cell carcinoma; he died three weeks later. These observations suggest that testicular cancer may be related to agriculture chemical exposure. However, more research is needed to determine the incidence of testicular cancer thatresults from occupational exposure to pesticides.

78-2415. Bai, A. R. K.; Reddy, C. C. (Dep. Zool., Bangalore Univ., Bangalore-1, India) **Laboratory toxicity of some insecticides to *Apis cerana indica*.** *J. Apic. Res.* 16(3): 161-162, 142; 1977. (13 references)

Toxic effects on the Indian honeybee brought about by the use of pesticides in India are examined. The sixteen insecticides examined included dichlorvos, methyl parathion, phosphamidon, quinalphos, fenitrothion, monocrotophos,

oxydemeton-methyl, dimethoate, carbophenothion, malathion, carbaryl, carbofuran, heptachlor, DDT, endrin, and BHC. Of these, the organophosphates and carbamates killed *A. cerana indica* more quickly than did organochlorine pesticides. The toxicity of these recommended insecticides ranged from very high to moderate, and all recommended concentrations are lethal to *A. cerana indica.* Dichlorvos, methyl parathion, posphamidon, quinalphos, fenitrothion, monocrotophos, and carbamate carbaryl were very highly toxic to *A. cerana indica.* DDT, BHC, and endrin were somewhat less toxic than the organophosphates and carbamates, and heptachlor was intermediate. It is suggested that mortality to bee colonies can be reduced by spraying when bees have ceased foraging after 19:00 hr, by adding repellents to the insecticides, and using only those compounds on crops near apiaries which are somewhat less harmful to bees.

78-2416. Matthiessen, P. (Cent. Overseas Pest Res., London W8 5SJ, England) **Uptake, metabolism and excretion of the molluscicide *N*-trityl morpholine by the tropical food fish *Sarotherodon mossambicus* (Peters).** *J. Fish Biol.* 11: 497-509; 1977. (15 references)

Uptake of *N*-trityl morpholine (Frescon) by fry and young juveniles of a laboratory bred strain of *Sarotherodon mossambicus* was studied over a period of 55 hr at 0.005 mg/dm^3 for the fry and 0.007 and 0.031 mg/dm^3 for the juveniles. After 55 hr exposure to these sub-lethal concentrations, concentration factors in whole fish were as high as 1300 (up to 40 mg/kg), with at least 80% of the absorbed activity being unchanged Frescon. About 40% of the activity was in bone, 16% in muscle, 16% in gut, and 10% in gill. Excretion studies showed the bile to be a route of Frescon excretion, and recovering fish excreted 50% of the absorbed activity in 55 hr. Application of these findings to field situations is a debatable point. Commercial Frescon is applied in a mixture of solvent and when added to water produces a suspension of fine crystals, a situation which was not present in these experiments. Field applied Frescon is known to adsorb readily onto fine particulate matter, which may or may not affect its availability to fish. Finally, uptake in the food supply may play an important role in field situations.

78-2417. Danon, S.; Chipilska, L. (Author address not given) **Ispoleuvane na kletuchni kulturi kato metod za opredelyane toksichnostta na pestitsidi. [Use of cell cultures for determining pesticide toxicity.]** *Khig. Zdraveopaz.* 20(1): 84-90; 1977. (12 references) (Bulgarian)

This study was designed as an attempt to test the use of cell cultures for determining toxicity of pesticides. The toxic effect of common pesticides paraquat, diquat, Lasso (alachlor) and benomyl was studied in F1 (human aminotic cells), Pulmo (diploid human embryo lung cells) and HeLa cultures growing in monolayer or in suspension. Marked cytotoxic effect (cellular dystrophy) in all cell cultures growing in monolayer was observed after incubation with paraquat at 157 mg/kg (LD50 after po administration to laboratory animals was 157 mg/kg), diquat at 400 mg/kg (LD50 260 mg/kg), lasso at 391 mg/kg (LD50 1,200 mg/kg) and benomyl at 9,000 mg/kg (LD50 9,000 mg/kg). The corresponding cytotoxic doses for cells growing in suspension were 15 mg/kg, 40 mg/kg, 100 mg/kg and 9,000 mg/kg, respectively.

78-2418. Biollaz, J.; Peters, G.; Diezi, J. (Inst. Pharmacol., Lausanne Univ., Lausanne, Switzerland) **Effects of oral administration of phenyl mercuric acetate during three months on renal functions in rats.** *Kidney Int.* 13(6): 535; 1978.

This abstract reports the effects of phenyl mercuric acetate (PMA) on renal function in 96 male and female adult Wistar rats given concentrations in the drinking water resulting in an average daily intake of 1.4 μg or 137 μg of mercury. Controls received sodium acetate in water. At the lower dose, the concentration of DNA in cortical and medullary renal tissue of female rats was significantly higher than in controls. At the higher dose, inulin clearance, PAH clearance and renal wet weight increased. In order to study whether pretreatment with mercury affects the development of renal lesions after glycerol, half the rats of each group were injected im with 10 ml/kg of glycerol. Eight days after glycerol, inulin clearance and PAH clearance were decreased in all groups to 50-60% of base values. Both clearances, however, remained significantly higher in the high intake group compared to controls. It is concluded that phenyl mercuric acetate does not alter overall kidney functions at the doses used in this study (which are similar to those ingested by human populations), but does increase renal tissue DNA content. At levels 100 times these intakes, significant changes of kidney function were seen.

78-2419. Lapis, K.; Simon, K.; Szende, B. (Inst. Pathol. Anat., Semmelweis Med. Univ., Budapest, Hungary) **Halak alkalmazasa a carcinogenezis kutatasban. [The use of fish in carcinogenesis studies.]** *Magy. Onkol.* 22(2): 75-86; 1978. (36 references) (Hungarian)

Study of the carcinogenic effects of the large number of chemicals used industrially is both essential and difficult. Short term *in vitro* tests cannot substitute for animal experiments *in vivo.* Carcinogenesis studies in fish represent promising experimental models since they can be conducted in a shorter time and at lower cost than tests on rodents. Parallel tests on fish and rodents can supplement one another and fulfill the requirement for testing of chemicals in at least two species. Examples of carcinogenesis tests using fish are cited from the literature to support this concept. Substances tested in this manner included DDT, carbon tetrachloride, amitrole, and thiourea, all of which produced hepatomas in exposed rainbow trout.

78-2420. Hughes, J. T. (Radcliffe Infirm., Oxford, England) **Pathology of the spinal cord. Chapter 8. Toxic and deficiency diseases.** *Maj. Probl. Pathol.* 6: 184-202; 1978. (73 references)

Many inorganic poisons affect the nervous system,

but usually the effect on the spinal cord is overshadowed by the effect on the brain. The chief examples of heavy-metal poisoning are copper, mercury, and lead. Organic poisons are more common and the list of compounds affecting the nervous system is very long. Tri-*o*-cresyl phosphate is the most notorious of these compounds whose toxicity apparently is due to selective enzymatic poisoning of certain neurons. A large outbreak occurred in Meknes of Morocco due to the contamination of cooking oil by synthetic lurbicating oil containing *o*-cresyl phosphate. In such epidemics the clinical picture of an acute polyneuropathy developing over a period of weeks and causing widespread but mainly distal paralysis, first of the lower limbs and later of the hands, developed. Spinal cord involvement either accompanied or followed the peripheral neuropathy and added an upper motor neuron lesion to the paralysis. In spite of the severity of the paralysis, in every outbreak the mortality of the condition has been low and consequently there have been few necropsies. However, the spinal cords examined did show leptomeningeal thickening. White matter degeneration was always present and of variable distribution involving the lateral corticospinal tracts. Changes were much more marked in the lower cord than in the upper segments. Neuronal changes were less striking. There was a reduction of anterior horn cells and those remaining were sometimes pyknotic and lacked Nissel substance.

78-2421. Bennington, J. L., editor (Dep. Pathol., Children's Hosp. San Francisco, San Francisco, CA) **Pathology of peripheral nerve. Chapter 4. Metabolic and toxic polyneuropathies.** *Maj. Probl. Pathol.* 9: 72-95; 1978. (76 references)

Metabolic and toxic polyneuropathies are reviewed with respect to features common to axonal degenerations, metabolic states, and exogenous toxins such as alcohol, mediations, heavy metals, industrial agents, acrylamide, diptheria toxin, myelinotoxic agents, Kepone (chlordecone), and organophosphorus compounds. Kepone is an industrial insecticide which causes a complex neurologic disorder, probably associated with small myelinated and unmyelinated nerve fibers. Organophosphorus compunds cause a neuropathy characterized by axonal degeneration affecting long fibers. Tri-*o*- cresyl phosphate neuropathy has been studied extensively; it was the cause of "Jamaican ginger palsy" in the 1930's. Unlike other organophosphorus compounds, tri-*o*- cresyl phosphate can cause degeneration of peripheral nerves.

78-2422. Smigielska, J. (Dep. Clin. & Lab. Diagn., Inst. Noninfect. Dis., Vet. Div. AR-T, Olsztyn, Poland) **Wplyw preparatu Foschlor R-20 na zawartosc wolnych nukleotydow w krwinkach czerwonych i wskazniki hemogramu u krolikow. [Effect of the preparation Foschlor R-20 on the content of free nucleotides in the erythrocytes and the hemogram indices in rabbits.]** *Med. Weter.* 33(9): 534-537; 1977. (13 references) (Polish)

Studies were performed on 20 rabbits in two groups, injected in with Foschlor R-20 (trichlorfon) in doses of 50 and 100 mg/kg, respectively. Biochemical and hematological tests were then performed at 0, 7, 14, and 21 days after the injections. The rabbits displayed somnolence, loss of appetitie, and a drop in body temperature to 37°C 30 to 40 min after injection. These symptoms persisted for 1-2 days and were stronger in the second group which received the larger dose. Other symptoms noted included reticulocytosis of the peripheral blood, changes in the free nucleotides, total phosphorus and inorganic phosphorus in the erythrocytes, and other symptoms usually associated with poisoning by organophosphorus compounds.

78-2423. El-Nawawy, A. S.; El-Din, A. T.; Komeil, A. M.; Khalifa, M. A. S.; El-Deeb, S. T.; Abou Donia, S.; Kadous, E. A. (Author address not given) **Effect of several pesticides on the activity of soil enzymes.** *Meded. Fac. Landbouwwet. Rijksuniv. Gent* 42(2): 901-909; 1977. (19 references)

The effects of atrazine, cyanazine, ametryne, prometryne, trifluralin, and fluometuron were studied on several soil enzymes: dehydrogenase, invertase, amylase and cellulase. Sandy clay soil was prepared by planting with cotton, picking out the cotton plants after 20 days, mixing and sieving the soil, and mixing the soil with concentrations of 5 g to 50 μ g of herbicide per 100 g of soil. Incubation was for 5 to 30 days. Fluometuron at 5 mg/100g caused an immediate suppression in dehydrogenase activity, which persisted after 5 days incubation, disappeared at 10 and 20 days incubation, and reappeared at 30 days. Similar behavior was seen with 50 mg/100 g. At higher concentrations enzyme suppression persisted throughout incubation. Atrazine was generally weaker than fluometuron, and trifluralin was similar to atrazine. Atrazine increased the activity of amylase and invertase but decreased the activity of cellulase. Similar findings were seen with cyanazine. It was not possible to make any structure/ activity relationships based upon the findings of this study.

78-2424. Hemsworth, B. N.; Wardhaugh, A. A. (Life Sci. Lab., Teesside Polytech., Middlesbrough, Cleveland, England) **Embryopathies due to spermatozoal impairment in *Xenopus laevis*.** *Mutat. Res.* 51(1): 45-53; 1978. (19 references)

An in vitro test system, involving gametes of *Xenopus laevis* has been used to study the effect of antifertility agents upon spermatozoa as manifest in developing embryos. Exposure to either the isomeric forms of dimethylmyleran, methyl methanesulfonate or γ-radiation led to development of a range of embryopathies, wherease treatment with steroidal drugs or the rodent epididymal chemosterilants α-chlorohydrin and trimethyl phosphate was compatible with production of apparently normal offspring. (Author abstract by permission)

78-2425. Harris, L. W.; FLeisher, J. H.; Yamamura, H. I. (SAREA-BL-REB, Aberdeen Proving Ground, MD

21010) **Acetylcholinesterase biosynthesis in guinea pig retinal tissue after irreversible enzyme inhibition.** *Natl. Tech. Inform. Serv.* AD-A031,037: 27p.; 1976. (29 references)

The rate of return of surface acetylcholinesterase (AChE) as measured in intact tissue from Soman-poisoned guinea pigs was more rapid than in contralateral sonicates during the first 12 hours. Cycloheximide caused a 53% decrease in the return of retinal AChE in Soman-treated animals and a 39% decrease in the return of AChE activity in Sarin-treated animals. Only 30% of the cyclohexamide-treated animals poisoned with Soman survived as compared to 80% of the poisoned controls not given cyclohexamide. Triton X-100 almost completely liberated retinal cholinesterases from membrane fragments. Of the total acetylcholine hydrolysis produced by retinal sonicates, only 6% of the activity was due to butyrylcholinesterase (BuChE). The application of affinity chromatography in the purifications of retinal AChE enabled the investigations to separate the majority of extraneous proteins from the AChE. Very little or no *de novo* synthesis of AChE was observed in normal animals but in survivors poisoned with Soman there was a significant increase in enzyme activity with time. The fact that there was a return of AChE activity after irreversible inhibition and a low survival in guinea pigs in which the return of enzyme activity was inhibited by cyclohexaminde provides strong evidence for *de novo* synthesis. (Author abstract by permission)

78-2426. Lieske, C. N.; Clark, J. H.; Lowe, J. R.; Horton, G. L.; Jewell, G. L.; Daasch, L. W. (SAREA-BL-REB, Aberdeen Proving Ground, MD 21010) **Spontaneous reactivation of acetylcholinesterase following organophosphate inhibition. III. Studies with *p*-nitrophenyl methylphenyl phosphinate.** *Natl. Tech. Inform. Serv.* AD-A035,231: 42p.; 1976. (24 references)

Inhibition constants for the phosphinylation of eel acetylcholinesterase by *p*-nitrophenyl methylphenyl phosphinate are reported, as are the constants for the subsequent spontaneous reactivation reaction. The data support the rationale that phosphinates are ideally suited for studies directed at advantagenously perturbing the spontaneous reactivation process. (Author abstract by permission)

78-2427. Berteau, P. E.; Deen, W. A.; Dimmick, R. L. (Naval Biosci. Lab., Sch. Pub. Health, Univ. California, Oakland, CA 94625) **Studies of effects of particle size on the toxicity of insecticide aerosols.** *Natl. Tech. Inform. Serv.* AD-A037,015: 75p.; 1976. (36 references)

Inhalation toxicity values for aerosols of four insecticides (chlorpyrifos, malathion, naled and resmethrin) have been expressed as LD50 values in mg/kg body-weight. The inhalation LD50 was compared with the oral LD50 for four pesticide aerosols of mass median dimater 2.1 μm. By this method of comparison chlorpyrifos was slightly more toxic to rats by the inhalation than by the oral route but naled was about 21 times more toxic by the inhalation route. Less marked differences between the two routes of administration were observed with mice. When the aerosol particle size was increased to mass median diameter 18 - 20 m, the toxicity of naled was reduced by at least one-fourth. Malathion and resmethrin aerosols were insufficiently toxic to kill animals by practicable acute inhalation exposure. Significant plamsa cholinesterase depression was observed when animals were exposed to sublethal doses of either chlorpyrifos or naled aerosols. (Author abstract by permission)

78-2428. Wolthuis, O. L.; Clason-von der Wiel, H. J.; Visser, R. P. L. S. (Med. Biol. Lab., TNO, Rijswijk, The Netherlands) **Oxime therapy and oxime blood levels in rats: Dependence on the dose of the organophosphate.** *Natl. Tech. Inform. Serv.* N77-26791: 12p.; 1976. (12 references)

Atropinised anaesthetised rats were intravenously (iv) injected with 4, 6 or 8 x LD50 of the organophosphourus cholinesterase inhibitor soman. Immediately thereafter all animals received an iv injection of 100 mg/kg of the oxime HS-6, followed in half of the animals by an infusion of HS-6 of 100 mg/kg/h. The single dose of the oxime delayed the onset of respiratory failure by one hour or more dependent on the dose of soman. Infusion of HS-6 further postponed respiratory failure except in the group given 8 x LD50 soman. It was found that at the same infusion rate of HS-6 the blood concentrations of this oxime rose considerably as the dose of soman was increased. It is suggested that the respiratory failure after low, lethal doses of soman is caused by reinhibition of cholinesterase by circulating soman in animals which recieve a single injection of HS-6. After higher doses of soman respiratory failure is caused by toxic side effects of the oxime. (Author abstract by permission)

78-2429. Carcinog. Prog., Div. Canc. Cause & Prevent., NCI, Bethesda, MD 20014 **Bioassay of dimethoate for possible carcinogenicity.** *Natl. Tech. Inform. Serv.* PB-264,367: 76p.; 1977. (10 references)

A bioassay of the carcinogenicity of technical-grade dimethoate was conducted using Osborne-Mendel rats and B6C3F1 mice. The test material was administered in feed to groups of 50 rats of each sex at either of two concentrations for 80 wk, followed by 35 wk of observation. Initial doses were not well tolerated; therefore, they were reduced during the study. The "time-weighted average doses" for rats were 155 and 310 ppm for males and 192 and 384 ppm for females. All surviving rats were killed between 113 and 115 wk. Dimethoate was administered in feed to groups of 50 male and 50 female mice at two concentrations. Female mice received diets containing 250 and 500 ppm of dimethoate for 80 wk male mice received the same dosage. However, high-dose males were returned to the control diet at 60 wk, and low-dose males at 69 wk. All surviving mice were killed between 93 and 94 wk. (Author abstract by permission)

78-2430. Simmon, V. F.; Mitchell, A. D.; Jorgenson, T. A. (Stanford Res. Inst., Menlo Park, CA 94025) **Evaluation of selected pesticides and chemical mutagens. *In vitro* and *in vivo* studies.** *Natl. Tech. Inform. Serv.* PB-268,647: 251p.; 1977. (26 references)

Twenty pesticides being reviewed as part of the EPA Substitute Chemical Program were studied for mutagenic activity by several *in vitro* and *in vivo* test procedures. The pesticides reviewed were: monocrotophos, bromacil, cacodylic acid, captan, chlorpyrifos, dinoseb, DSMA, fenthion, folpet, azinphos-methyl, malathion methomyl, monuron, MSMA, parathion, parathion-methyl, quintozene (PCNB), phorate, simazine, and trifluralin. Ten of the twenty compounds were evaluated *in vivo* by the mouse dominant lethal test. All twenty compounds were tested *in vitro*. None of the ten compounds tested in the mouse produced a dominant lethal response. Ten of the twwenty compounds were mutagenic in one or more *in vitro* assays. Two were mutagenic in all of the *in vitro* assays: captan and folpet. (Author abstract by permission)

78-2431. Parrish, P. R.; Dyar, E. E.; Lindberg, M. A.; Shankia, C. M.; Enos, J. M. (EG & G, Bionomics Mar. Res. Lab., Pensacola, FL 32507) **Chronic toxicity of methoxychlor, malathion, and carbofuran to sheepshead minnows (*Cyprinodon variegatus*).** *Natl. Tech. Inform. Serv.* PB-272,101: 36p.; 1977. (35 references)

Sheepshead minnows (*Cyrpinodon variegatus*) were exposed to each of three pesticides, methoxychlor, malathion, and carbofuran, in flowing seawater to determine the acute and chronic (partial life-cycle) effects. Mortality of adult fish exposed to concentrations of methoxychlor $\geq$ 23 μg/l and hatching success of fry from eggs spawned by fish exposed to 23 μg/l were significantly different from the control. The maximum acceptable toxicant concentration (MATC) was estimated to be $>$ 12 $<$ 23 μg/l; application factor (AF) limits were 0.24-0.47. Mortality of adult fish exposed to concentrations of malathion $\geq$ 18 μg/l and mortality of fry hatched from eggs spawned by fish exposed to 9 and 18 μ/g were significantly different from the control. The MATC was estimated to $>$ 4 $<$ 9 μg/l; AF limits were 0.08-0.18. Mortality of adult fish exposed to concentrations of carbofuran $\geq$ 49 μg/l, hatching success of fry from eggs spawned by fish exposed to 49 μg/l, and mortality of fry hatched from eggs spawned by fish exposed to 23 and 49 μg/l were significantly different from the control. The MATC was estimated to $>$ 15 $<$ 23 μg/l; AF limits were 0.04-0.06. (Author abstract by permission)

78-2432. Reiner, E. (Inst. Med. Res. & Occup. Health, Zagreb, Yugoslavia) **Toxicology of anticholinesterase pesticides.** *Natl. Tech. Inform. Serv.* PB-268,652: 178 p.; 1977. (233 references)

The effect of pesticides was studied in humans and animal models, and on enzymes in order to developed a better understanding of their mechanism of action, and thus provide guidance for their safe use. It was shown that reduction of human blood cholinesterase activity is a good indicator of exposure to anticholinesterase pesticides. Regular measurements of blood cholinesterase activity and removal of individuals from suspected occupational environments prevented hazardous absorption of pesticides in occupationally exposed people. Ophthalmological studies indicated some functional eye impairment in people exposed to pesticides for many years. The effect of one organophosphate ester used as a pesticide (trichlorfon; Metrifonate (R) was studied in detail in humans, animals (rats) and enzymes (cholinesterases). It was shown that trichlorfon does not inhibit mammalian cholinesterases; inhibition of the enzyme is caused by dichlorvos formed from trichlorfon. The mechanism of reaction of acetylcholinesterase and cholinesterase with other inhibitors and with substrates was also studied in order to evaluate to what extent sites other than the catalytic sites are involved in the binding of ligands. Gas chromatographic methods for measuring pesticide residues were used to determine the concentrations of chlorinated hydrocarbon pesticides in the blood of the general population in Yugoslavia and for studies of organophosphate residues in urine. (Author abstract by permission)

78-2433. Carcinog. Prog., Div. Canc. Cause & Prevent., NCI, Bethesda, MD 20014 **Bioassay of dichlorvos for possible carcinogenicity.** *Natl. Tech. Inform. Serv.* PB-270,937: 103 p.; 1977. (16 references)

A bioassay for the possible carcinogenicity of technical-grade dichlorvos was conducted using Osborne-Mendel rats and B6C3F1 mice. The test material was administered in the diet at two concentrations for 80 wk to groups of 50 animals of each species and sex. The test animals were held for observation, and surviving rats were killed at 110-111 wk and surviving mice at 92-94 wk from initiation of the study. Initial doses in both species were not well tolerated and they were lowered after a few wk. Time-weighted average doses for both males and females were 150 and 326 for rats and 318 and 635 ppm for mice. After the doses were reduced, no toxic signs directly attributable to the compound were observed. However average weights of high-dose animals were slightly depressed. Survival was not dose-related to either species. (Author abstract by permission)

78-2434. Ohkawa, H. (Res. Dep., Pestic. Div., Sumitomo Chem. Co. Ltd., Takarazuka, Hyogo, Japan) **[Biological activity and metabolism of the chiral isomers of organophosphorus compounds.]** *Nippon Nogai Kagaku Kaishi (J. Agric. Chem. Soc. Jpn.)* 52(6): R63-R69; 1978. (19 references) (Japanese)

The biological activity and metabolism of chiral organophosphate isomers with four different substituents on the phosphorus atom are described. The selective toxicity of (+)- EPN is particularly noted; in spite of its strong insecticidal activity this compound does not produces delayed neurotoxicity in fowl. The difference in toxicity between (+)- and (-)- EPN is attributed to their inverse actions on neurotoxic esterase and acetylcholinesterase in the fowl brain. The more rapid metabolism of (-)- ethyl, 2-nitro-5-methyl- phenyl- isopropyl phosphorothionoamidate (S-2571) than that of the (+)- isomer is also described in connection with stereospecific metabolism in the rabbit.

78-2435. Ishikawa, M.; Nishide, E.; Nisizawa, K. (Dep. Fish., Coll. Agric. Vet. Med., Nippon Univ., Tokyo 154, Japan) **[Effects of PCP and APT on several hydrolase activities of the hepatopancreas of raising carp.]** *Nippon Suisan Gakkaishi (Bull. Jpn. Soc. Sci. Fish.)* 43(12): 1433-1440; 1977. (12 references) (Japanese)

The activities of β-glycuronidase, acid phosphatase, and acidribonuclease changed in almost similar patterns after injection of a saline solution containing sodium pentachlorophenolate (Na-PCP) into carp (*Cyprinus carpio* L). The enhancement of enzyme activities after 24 hr was highest following injection of 5 μg/g body weight, and those given 10 μg/g and 15 μg/g injections followed in order. A maximun increase was attained 12 hr after the 15 μg injection, followed by rapid decrease in activity. The enzyme activities, particularly that of β-glucuronidase, were enhanced to some extent by the injection of saline solution only. A comparison was made of the changes in the activities of these three enzymes during culture in a medium containing 0.1 ppm Na-PCP and those in a medium containing 10 ppm ATP (2-amino- 4-phenyl- thiazole, a fish anesthetic). Changes caused by the two substances were significantly different in patterns, suggesting that mechanisms of these two substances on lysosomal enzyme activities may be different.

78-2436. Benedek, P.; Komlodi, J.; Herczeg, G.; Dely, G. (MEM Plant Prot. Cent., Budapest, Hungary) **Elokiserletek mehkimelo vedekezesi eljarasok kidolgozasara viragzo lucernasokban: inszekticidek kontakt maradek toxicitasa mezelo meheken. [Preliminary experiments aimed at developing seed lucerne pest control methods safe for bees: toxicity of field-weathered insecticide residues to honeybees.]** *Novenytermeles* 25(2): 129-140; 1976. (17 references) (Hungarian)

Pest control on seed lucerne requires treatment during the blossoming period, when the preparations applied present a risk to foraging bees. In a search for compounds which would reduce this risk, test substances were sprayed on lucerne plots at twilight; lucerne specimens were collected 8, 12, and 16 hr later and placed in cages containing honeybee workers. Dead bees were counted after 24 hr of exposure. One group of chemicals, including methyl parathion, fenitrothion, and carbaryl, caused extensive mortality of the bees even at 12 and 16 hr sampling. A second group of products, including tetrachlorvinphos, mevinphos, formothion, and dimethoate, caused high mortality at 8 hr after spraying and lower mortality after 12 or 16 hr. Mortality was acceptably low with mevinphos; its degradation was promoted by high air temperatures. The third and largest group of compounds, including endosulfan, fenitrothion, dioxacarb, heptenophos, toxaphene, and cartap, produced moderate or low mortality on 8, 12, and 16 hr samples. Therefore these compounds be suitable for use as evening sprays.

78-2437. Bimber, D. L.;; Dep. Biol., State Univ. New York, Fredonia, NY 14063; Mitchell, R. A. **Effects of diquat on amphibian embryo development.** *Ohio J. Sci.* 78(1): 50-51; 1978. (7 references)

The possible influence of diquat on the development of the eggs of *Rana pipiens* was determined. Initial concentrations of 100 ppm were used. Field applications of 1-5 ppm are normal for control of weed, but local concentrations may significantly exceed the recommended dosages. Fertilization efficiency was somewhat reduced when diquat was added to sperm suspensions, but not to a statistically significant level. Little difference was noted in survivorship of the test subjects and controls prior to hatching. However, none of the tadpoles subjected to diquat either during fertilization or later development, survived beyong 14 days of hatching. The frequency of exogastrulation appeared to be elevated in both groups incubated in diquat during development. Although the eggs of *R. pipiens* were relatively insensitive to diquat at 100 ppm, increased rates of exogastrulation and mortality may occur.

78-2438. Hartgrove, R. W., Jr.; Hundley, S. G.; Webb, R. E. (Dep. Hum. Nutri. & Foods, Virginia Polytech. Inst., Blacksburg, VA 24061) **Characterization of the hepatic mixed function oxidase system in endrin-resistant and -susceptible pine voles.** *Pestic. Biochem. Physiol.* 7(2): 146-153; 1977. (27 references)

Basal and endrin-inducible levels of micrososmal activity were investigated to characterize the hepatic microsomal mixed function oxidase system in endrin-resistant and -susceptible pine voles. Pines voles were raised in laboratory breeding colonies. Resistant breeding colonies were established by mating survivors of a single oral dose of endrin (20 mg/kg). Endrin treatment resulted in significant alteration in the activity of the microsomal system although the degree and direction of changes depended on the model substrate and the species investigated. The rate of ethylmorphine *N* -demethylation was consistently decreased in pine vole, and was increased in white mice after endrin treatment. The rate of aniline hydroxylation was increased in pine vole and appeared to increase to a greater degree on exposure to a higher level of endrin. In white mice an even greater increase in rate was noted. The rates of formation of fluorescent product was decreased significantly in pine voles after endrin exposure. In white mice the rate of metabolic conversion of benz-a-pyrene to fluorescent product was increased significantly at a level of 4 mg/kg. However, the rate normalized for white mice when dosed at 10 mg/kg. Cytochrome P450 concentrations were unchanged after endrin treatment of pine voles, but were increased in white mice. A higher level of endrin, 10 mg/kg, increased the concentration in white mice even more. Microsomal activity from resistant pine voles was typically higher than microsomal activity from susceptible voles although most differences were not significant. The small strain differences were insufficient to explain the strain difference in susceptibility to endrin.

78-2439. Varade, P. A.; Nakat, S. S. (Punjabrao Krishi Vidyapeeth, Akola, India) **Effect of endrin on available nitrogen content and microflora of a black cotton soil.** *Pesticides* 11(5): 33-35; 1977. (20 references)

The effect of endrin on ammonification, nitrification

and soil microbe population in the black cotton soil of Nagpur was studied. Endrin was added at 10, 50, 100, 150, and 200 ppm to the soil. At 100 and 200 ppm endrin, temporary inhibition to the ammonification and nitrification of soil was noted for about 15 days. Lower doses of endrin stimulated the process. It is noted that lower doses were stimulatory to the bacterial population, whereas higher doses depressed the population for up to 45 days. Fungi were tolerant to the doses of endrin up to as high as 200 ppm.

78-2440. Gupta, P. K. (Ind. Toxicol. Res. Cent., Lucknow, India) **Comprehensive pesticide requirements with particular reference to toxicology and its estimates.** *Pesticides* 11(6): 43-46, 54; 1976.

Toxicology and estimates on parameters needed for registration of pesticides are discussed. LD50 in laboratory animals, dermal LD50, inhalation tests, eye irritation studies and oral LD50 in avian species are necessary tests for evaluation of a pesticides. Subacute studies involve short term repeated exposures for 90 days with observations of such things as growth, food intake, appearance, behavior, mortality, kidney damage as well as tests on other organs. Other studies are concerned with metabolism, multigeneration reproduction, teratogenicity, and carcnogenicity.

78-2441. Gupta, R. C.; Paul, B. S. (Dep. Pharmacol., Coll. Vet. Sci., Punjab Agric. Univ. Ludhiana, India) **Sub-acute toxicity study of malathion in *Bubalus bubalus* (buffalo).** *Pesticides* 11(8): 26-29; 1977. (32 references)

The effect or oral ingestion of malathion sprayed fodder on various physiologic and biochemical parameters in buffalo calves was investigated. The administration of malathion (458.26 mg/day) was continued for 28 days, and blood samples were taken for analysis of residue at 0, 3, 7, 14, 21, and 28 days during pesticide administration, and 3, 7, and 14 days after administration was terminated. Plasma and RBC cholinesterases were inhibited during and after feeding of the pesticide. Hypoglycemia was observed from the 7th to the 28th day; blood glucose returned to normal 14 days after treatment stopped. SGOP, SGPT, SALP, and SCAP were elevated during treatment.

78-2442. Murugan, S.; Sundaram, A.; Mathan, K. K.; Subramanian, S. S.; Subramanian, K. (Pesticides Testing Laboratory, Coimbatore 3, India) **Ammoniacal and nitrate nitrogen production in soil as influenced by mephosfolan alone and in combination with urea.** *Pesticides* 11(10): 32-34; 1977. (6 references)

The effect of Cytrolane (mephosfolan) on the ammoniacal and nitrate nitrogen production in soil was studied by a soil incubation investigation. Mephosfolan (4, 6 and 8 kg/acre) inhibited production of soil ammonia. When urea as a nitrogen source was added along with mephosfolan, there was no inhibition. Nitrate production was decreased by the pesticide at rates of 6 and 8 kg/acre. Inclusion of urea with mephosfolan also prevented reduction of nitrate production. Both ammoniacal and nitrogen production were progressively reduced during the period of incubation.

78-2443. Rodell, S.; Funke, B. R.; Schulz, J. T. (Dep. Bacteriol., N. Dakota State Univ., Fargo, ND 58102) **Effects of insecticides on acetylene reduction by *Azotobacter vinelandii* and soybean nodules.** *Plant Soil* 47(2): 375-381; 1977. (14 references)

Nitrogen fixation by soybean nodules and *Azotobacter vinelandii* was studied using the acetylene reduction technique with regard to the effects of nine insecticides: the organophosphates Gardona, (tetrachlorvinphos), Imidan (phosmet), Supracide (methidathion) and trichlorfon; and the carbamates aldicarb, carbaryl, carbofuran, methomyl and propoxur. Only Gardona at 50 and 250 ppm inhibited the nitrogenase activity of *A. vinelandii* to a significant degree. Propoxur and carbofuran at concentrations of 5 and 50 ppm and methomyl at 50 ppm induced phytotoxic effects on soybeans, which were manifested by some leaf discoloration and spotting. This was not correlated with loss of nitrogenase activity or serious inhibition of plant growth. None of the insecticides caused any significant reduction in the ability of excised soybean nodules to reduce acetylene.

78-2444. Zimakowska-Gnoinska, D. (Dep. Ecol. Bioenerg., Inst. Ecol., Polish Acad. Sci., P-05150 Lomianki, Poland) **Toxicological and physiological aspects of the action of herbicide, sodium salt of 2,4-D, on *Asellus aquaticus* L (Isopoda).** *Pol. Arch. Hydrobiol.* 24(3): 389-411; 1977. (76 references)

The toxicology of the sodium salt of 2,4-dichlorophenoxyacetic acid (2,4-D) was studied in *Asellus aquaticus* L with regard to the median lethal concentration (LC50), the median paralysis concentration (C50), respiration (oxygen consumption, carbon dioxide excretion and the respiratory quotient), bioenergetic indices, and the accumulation and excretion of 2,4-D. Mortality of all specimens was achieved after exposure to 0.17 - 5.00 m*M* 2,4-D, even when the animals were first exposed and later transferred to pure water. Those kept in the contaminated water died within 24 hr; those populations exposed and later transferred reached 100% mortality after 150 days. The persistence coefficient (*T*) was found to be lower than 1, indicating a tendency of paralysis to continue toward death. The C50 value after 24 hr exposure was 1.07 g/l and after 48 hr exposure was 0.53 g/l. A concentration of 5.00 m*M* markedly increased oxygen consumption by 142% compared with controls and doubled the carbon dioxide excretion. It is suggested that 2,4-D acts on the respiratory chain, causing an uncoupling of oxidative phosphorylation as well as disturbing the link between electron transport and phosphorylation. The increase in carbon dioxide excretion greatly exceeded the rise in oxygen consumption, probably due to a more active anaerobic glycolysis. The results suggest the toxic action of 2,4-D can cause general disturbances in the biocenosis of water reservoirs and has a particularly insidious aspect.

78-2445. Johnson, C. R.; Gieke, P. A. (Div. Biol. Control, Univ. California, Albany, CA 94706) **The effects of the herbicide diquat on *Gambusia affinis* and some associated fauna in freshwater ponds.** *Proc. Pap. Annu. Conf. Calif. Mosq. Vector Control Assoc.* 45: 59-60; 1977. (6 references)

Diquat at a concentration of 0.5 ppm (AI)/acre was applied to the surface of two ponds. Floating live cages containing *Gambusia affinis, Rana catesbeiana* tadpoles, and the gastropods *Physa virgata* and *Planorbella tenui* were immersed in the treated water. These cages were inspected at 12, 24, and 48 hr after immersion for survival and aberrant behavior. No deaths were recorded among the tadpoles or *Planorbella tenui,* and only one death was noted in *Physa virgata.* All tadpoles and live mollusks appeared normal in behavior. Male *G. affinis* were more susceptible to diquat than were females, with 8.6% mortality occurring in males after 48 hr exposure, compared to 4.7% for females. No loss of orientation was noted in any of the *G. affinis.* It would appear that diquat can be used with relative safety at concentrations of 0.5 ppm in *G. affinis* habitats, as the mortality noted within this study was within reasonable limits.

78-2446. Johnson, C. R. (Div. Biol. Control, Univ. California, Albany, CA 94706) **The effect of exposure to the organophosphorus insecticide chlorpyrifos on the feeding rate in the mosquitofish, *Gambusa affinis.*** *Proc. Pap. Annu. Conf. Calif. Mosq. Vector Contr. Assoc.* 45: 69-70; 1977. (2 references)

Female *Gambusia affinis* ranging in size from 35 to 55 mm in standard length were exposed to chlorpyrifos at a concentration of 50 ppb for 24 hr. A second group was exposed to 50 ppb for 48 hrs. The predation rate on *D. pulex* was significantly reduced in *F. allinis* by exposure to 50 ppm chlorpyrifos for both time periods. Similar results were found for the predation rate on *Cs. incidens* by those exposed for 48 hr, but not by those exposed for 24 hrs. The findings are discussed in relation to food preference of *G. affinis* and with density, behavior, and size of the food items.

78-2447. Garszel, J.; Oledzka, R. (Inst. Biopharm., Acad. Med., Warsaw, Poland) **Badania nad wplywem chlorfenwinfosu i karbarylu na metabolizm wapnia i fosforu w kosciach szczurow. II. Badania prowadzone *in vitro.* [Investigations on the effects of chlorfenvinfos and carbaryl on calcium and phosphorus metabolism in the skeleton of rats. II. *In vitro* investigations.]** *Rocz. Panstw. Zakl. Hig.* 29(2): 165-171; 1978. (8 references) (Polish)

The inorganic matrix (hydroxyapatite) which gives rigidity to bones and teeth was examined after *in vitro* incubation of rat skeletal components with different concentrations of two insecticides. Chlorfenvinfos and carbaryl at concentrations of 0.02 or 0.04 m*M* had no significant effect on the solubility of hydroxyapatite crystals. Chlorfenvinfos tended to increase calcium concentration in the buffer. Carbaryl was either inhibitory or stimulatory, depending on the dose and duration of crystal incubation, a result which suggests possible in vitro pesticide degradation. Both pesticides also aided slightly in the binding of calcium and phosphate ions, resulting in the development of hydroxyapatite. It is suggested that the pesticidal effect on calcium and phosphate as observed in this experiment may be regulated by other exogenous biological factors.

78-2448. Fonberg-Broczek, M. (Res. Inst. Food & Commod., Natl. Inst. Hyg., Warsaw, Poland) **Wplyw manebu i zinebu na aktywnosc wybranych enzymow surowicy krwi i watroby szczura. [Effects of maneb and zineb on the activity of selected enzymes in serum and liver of rats.]** *Rocz. Panstw. Zakl. Hig.* 29(2): 173-179; 1978. (21 references) (Polish)

The ethylene bis dithiocarbamate fungicides maneb and zineb were given with food in 0.2% concentrations and the response of serum and liver enzymes was studied. The activity of *p*- nitroanisol demethylase decreased significantly after 2, 4, 6, and 12 wk on the diet. In addition, the induction effect of phenobarbital on *p*- nitroanisol demethylation was reduced. No changes were seen in the activities of δ-aminolevulinic acid synthetase, uridine diphosphate-glucuronyl transferase, or alkaline phosphatase. After 4 wk on a diet without fungicides, the activity of *p*- nitroanisol demethylase returned to control levels.

78-2449. Tyrkiel, E.; Bojanowska, A. (Inst. Toxicol. Health, Natl. Inst. Hig., Warsaw, Poland) **Wplyw insektycydow z grupy karbaminianow na reprodukcje zwierzat laboratoryjnych. [Effect of insecticides from the carbamate group on reproduction of laboratory animals.]** *Rocz. Panstw. Zakl. Hig.* 29(2): 181-192; 1978. (20 references) (Polish)

The effect of propoxur on the reproductive functions was studied in cross breeds of Balb/c and CF/W mice over three generations. Propoxur was given in the food at concentrations of 100, 200, 400, 800, 1600 and 3200 mg/kg. Survival time of parents was reduced at the highest dose. Males were more susceptible. Possible disturbances in the sexual cycle were indicated by an increase in the time between mating and the first labor in all experimental groups and the time between the first and the last labor in those receiving the highest dose. The survival rate of the offspring was decreased in the highest dose group due to abandonment of the young by the mothers.

78-2450. Palmiter, R. D.; Mulvihill, E. R. (Dep. Biochem., Univ. Washington, Seattle, WA 98195) **Esterogenic activity of the insecticide Kepone on the chicken oviduct.** *Science* 201(4353): 356-358; 1978. (21 references)

Kepone (chlordecone) induces ovalbumin and conalbumin synthesis in explants of chick oviduct in vitro by acting as a weak estrogen. It binds to the nuclear estrogen receptor and is antagonized by the antiestrogen tamoxifen. Kepone also induces egg white protein synthesis *in vivo* by direct interaction with estrogen receptors and by indirectly increasing the concentration of progesterone in the serum. (Author abstract by permission. Copyright 1978 by the American Association for the Advancement of Science)

78-2451. Crookshank, H. R.; Smalley, H. E. (Vet. Toxicol. & Entomol. Res. Lab., Agric. Res. Serv. USDA., Coll. Station, TX 77840) **Activated charcoal and the omental fat residues of BHC, DDT, dieldrin, and heptachlor epoxide in sheep.** *Southwest. Vet.* 31(1): 39-41; 1978. (5 references)

Activated charcoal of vegetable origin was added to sheep fodder contaminated with BHC, DDT, dieldrin, and heptachlor, to study the effect of charcoal on the insecticide residue levels in omental fat. A control group of sheep was given a diet containing 2.5 ppm dieldrin, and 10 ppm each of BHC, DDT, and heptachlor. The experimental group received the same amounts of insecticide in addition to charcoal which comprised 1% of the total diet. In the charcoal-fed sheep, dieldrin residue levels decreased, heptachlor levels decreased slightly, DDT levels increased, and the BHC level remained nearly the same as that in control sheep. The results indicate that activated charcoal is selective in the reduction of insecticide residues in sheep tissues.

78-2452. Lee, T. H.; Lee, M. W. (Dep. Intern. Med., Chonnam Univ. Med. Sch. Kwangju, Korea) **[Inhibitory effect of a rodenticide RH-787 on the glucose metabolism of erythrocytes.]** *Taehan Naekwa Hakhoe Chapchi* 20(7): 597-601; 1977. (11 references) (Japanese)

Effects of the rodenticide RH-787 (*N*-3-pyridyl methyl-*N'*- *p*-nitrophenyl urea) on the uptake of methylene blue and glucose consumption by erythrocytes was studied *in vitro* and *in vivo*. Uptake of methylene blue was depressed 10 to 20% by 1.0 m*M* RH-787 when added *in vitro* to human and rabbit erythrocytes. This inhibitory effect of the rodenticide was accentuated by the prior treatment of human erythrocytes with RH-787. The erythrocytes from RH-787 poisoned patients showed a markedly depressed glucose consumption as well as a decreased uptake of methylene blue in the presence of glucose. These results indicate that RH-787 exerts a direct inhibitory effect on the glucose metabolism of erythrocytes. Various mechanisms for this inhibitory effect are discussed.

78-2453. Ree, K. (Dermatol. Dept., Rikshospit., Oslo, Norway) **Hexicid 1% (Gamma hexaklorocyclohexan 1%) Et nytt luktfritt middel til behandling av scabies. [Hexicid 1% (gamma hexachlorocyclohexan 1%). A new odorless agent for controlling scabies.]** *Tidsskr. Nor. Laegeforen.* 98(15): 792-793; 1978. (9 references) (Norwegian)

Hexicid 1% (lindane, β-BHC) has been found to be convenient to use and highly effective in the treatment of scabies. Toxic side effects with irritation of the central nervous system have nevertheless been reported after improper or prolonged use. It is therefore recommended that each patient get a maximum of 2 applications, and children under 3 yr and pregnant women, as well as lactating mothers should not be given this treatment. Most earlier studies recommended bathing before topical application of Hexicid 1%. The authors applied the drug without preliminary bathing and attained an equally high rate of success. They tested the drug on 100 patients with demonstrable *Sarcoptes scabiei*. All patients and their families were simultaneously treated over the entire body surface except head and face, the cream being left on the skin for 24 hr. After 4-6 wk, 37 of the patients reported for check-ups, 3 of whom still had complaints, and one a red burning skin on the upper chest 1 wk after the Hexicid treatment (these symptoms disappeared after a few days of application of a mild steroid salve). The remaining 63 patients were contacted by mail or phone. Twelve did not respond, 6 of those remaining had taken another scabies treatment, and the remaining 45 had completely recovered, with negligible side effects.

78-2454. Hertzenberg, S. (Author address not given) **Hexicid 1% krem. Et nytt mid- del mot skabb. [Hexicid 1% Cream. A new agent against scabies.]** *Tidsskr. Nor. Laegeforen. (15): 797-798 (1978)* 98(15): 797-798; 1978. (6 references) (Norwegian)

Hexicid (γ-BHC, lindane) is an insecticide formulation consisting almost totally of the least toxic and least sensitizing isomer of BHC. In animal tests, ingestion of large quantities causes seizures (spasms) which have also been noted in children after repeated topical application or single applications of large quantities. Blood dyscrasias have been observed in persons after using hexicid in spray form as an insecticide. The US FDA has recently received reports on central nervous system toxicity due to the compound and advises against careless use of hexicid as an anti-scabies agent. Side effects which have been noted from clinical use of hexicid cream include nausea, vomiting, spasms, weak respiration with cyanosis and blood dyscrasias. These can be avoided if the instructions for use are followed exactly.

78-2455. Periquet, A.; De Saint-Blanquat, G.; Derache, R.; Souqual, M. C. (Groupe Rech. Toxicol. Aliment & Boissons, Inst. Physiol., Univ. Paul Sabatier Toulouse, INSERM, Touluse F-31400, France.) **Inflammation experimentale apres un traitement subchronique au nabame chez le rat. [Experimentally induced inflammation after subchronic treatment with nabam.]** *Toxicology* 10(1): 3-12; 1978. (48 references) (French)

The effect of feeding rats 100 ppm Nabam (*N,N*- ethylene-bis [dithiocarbamate] disodium) for 1 mo on the inflammatory response to turpentine-induced granuloma was studied by determining the impact on various physiological functions because of the absence of any clinical or histopathological changes. The inflammatory reaction, involving first the accumulation of mucopolysaccharides followed by collagen formation and subsequent modification of non-fibrillar protein levels, was affected in that, in treated animals, the total amount of mucopoly saccharides (given by the glucosamine content), of glucuronic acid mucopolysaccharides, and sialic acid mucopolysaccharides (determination of *N*-acetylneuraminic acid) were reduced thereby diminishing the inflammatory response. Total granuloma mucopolysaccharides in control animals were 43.6 mg/g as compared with 30.7 mg/g tissue in treated rats. Nabam administration had no effect on the weight increase of the rats. The result is attributable to the accelerated destruction of cells responsible for mucopolysaccharide production.

78-2456. Palmer, A. K.; Cozens, D. D.; Spicer, E. J. F.; Worden, A. N. (Huntingdon Res. Cent., Huntingdon, Cambs., PE18 6ES, England) **Effects of lindane upon reproductive function in a 3-generation study in rats.** *Toxicology* 10(1): 45-54; 1978. (7 references)

Lindane at dietary concentrations of 25, 50 or 100 ppm did not cause any adverse effects upon the reproductive function of CD rats over three generations. There were no major malformations, while the distribution of minor variants was not compound or dose related. At 21 days of age there was a dose related tendency for increased liver weight, and enlarged hepatocytes were seen in some of the 10 male and 10 female F3B animals of each group. However, the significance of these latter findings was considered doubtful when compared with the lack of effects on the growth and reproductive performance of the preceding generations.

78-2457. Glickman, A. H.; Statham, C. N.; Wu, A.; Lech, J. J. (Dep. Pharmacol., Med. Coll. Wisconsin, Milwaukee, WI 53233) **Studies of the uptake, metabolism, and disposition of pentachlorophenol and pentachloroanisole in rainbow trout.** *Toxicol. Appl. Pharmacol.* 41(3): 649-658; 1977. (13 references)

Pentachlorophenol (PCP) and pentachloroanisole (PCA) were rapidly taken up by rainbow trout exposed to these compounds at 0.025 mg/l in water. After exposure of trout to PCP for 24 hr, the liver, blood, fat, and muscle contained 16, 6.5, 6.0, and 1.0 μg/g, respectively. The concentrations of PCA in the same tissues after an exposure to [^{14}C]PCA were of the same order of magnitude as was found with PCP except that fat contained as much as 80 μg/g. Elimination rates for ^{14}C from the blood, muscle, fat, and liver after a similar exposure were different for PCA and PCP. The half-lives for PCP residues in the blood, liver, fat, and muscle were 6.2, 9.8, 23 and 6.9 hr, respectively, while PCA was more persistent having half-lives in these same tissues of 6.3, 6.9, 23, and 6.3 days. Thin-layer chromatographic and GC-MS analyses of the tissues of the PCP-exposed trout indicated that there was no methylation of PCP in any of the tissues studied. Bile from PCP-exposure trout contained high concentrations (250 μg/g) of PCP, mostly as the glucuronide conjugate, but no glucuronide (10 μg/g) as well as PCA, indicating demethylation of this compound *in vivo* by rainbow trout. Inclusion of 1 mg/l of piperonyl butoxide in the PCA exposure system decreased the formation of PCP from PCA. (Author abstract by permission)

78-2458. Abdelghani, A. A.; Mason, J. W.; Anderson, A. C.; Englande, A. J.; Diem, J. E. (Dep. Environ. Health Sci. Tulane Univ., New Orleans, LA) **Bioconcentration of MSMA in crayfish (*Procambarus* sp.)** *Trace Subst. Environ. Health* 10: 235-245; 1976. (17 references)

The uptake and fate of MSMA in crayfish was studied. Crayfish were exposed to MSMA concentrations of 0.5 mg/l or 5.0 mg/l. These concentrations correspond to possible exposures in actual use. Animals were examined at 24 hr intervals. Tissues such as those of the gills, gastrintestinal tract, hepatopancreas, exoskeleton and abdominal muscle concentrated MSMA to levels above the aqueous concentrations. At 56 days concentration ratios were 3.4-5.0 in hepatopancreas, 2.0-2.8 in gills, 1.7-3.0 in exoskeleton, 1.4-2.0 in gastrointestinal tract, and 1.1-1.4 in abdominal muscle. Accumulation passes through 2 distinct stages of uptake. Loss following exposure was established to follow the kinetics of a simple, two compartment system in which loss from the slower compartment passes through the faster compartment in exchange to the environment. [At the 10th Annual Conference on Trace Substances in Environmental Health Sponsored by the University of Missouri Environmental Trace Substances Research Center]

78-2459. Geoghegan, M. J.; Lynch, F. J. (Dep. Ind. Microbiol., Ardmore, Dublin 4, Ireland) **Varietal resistance to benomyl in** *Cercospora beticola. Trans. Br. Mycol. Soc.* 68(3): 476-478; 1977. (11 references)

Various isolates of *Cercospora beticola* were studied for their resistance to benomyl, and results are related to resistance in the field. Isolates were grown in both light and darkness on potato dextrose agar containing 14.4, 1.44, 0.144 and 0.0144 μg benomyl per ml. Samples of the organisms were incubated with a solution of the fungicide for 11 days at 25°C and 90% relative humidity. None of the strains grew at the highest fungicide concentration. At 1.44 μg benomyl/ml, some varients failed to grow, whereas others grew reasonably well in both light and darkness. The Greek strains were about 10 times more resistant to benomyl than the Colorado strains which had never previously been exposed to the fungicide, suggesting selection for resistance rather than an improved tolerance level. It is suggested that since many *Cercospora* species are so closely related they may represent variants of a species cluster, differentiated by environmental factors and by interactions with the host plant. This would account for the emergence of resistant races that would be continually selected under conditions of environmental stress such as that exerted by benomyl.

78-2460. Grits, M. A. (S. N. Vysheslavskii Res. Inst. Exp. Vet. Sci., Minsk. USSR) **Vliyanie aminnoi soli 2,4-D na urovenʹ kaliya, natriya i alʹdosterona v krovi telyat. [Effect of amine salt of 2,4-D on the level of potassium, sodium and aldosterone in calves' blood.]** *Vestsi Akad. Navuk B. SSR Ser. Biyal. Navuk* (1): 129-130; 1978. (Russian)

Single administration of the amine salt of 2,4-D at 1000 mg/kg to calves caused an increase in sodium level in the blood plasma and RBCs but did not change the content of potassium and aldosterone. At 400 mg/kg 2,4-DA caused hyperpotassemia without hyponatremia, and increased aldosterone levels in the plasma within 6 and 12 hr after administration. Increase in the aldosterone level followed the development of hyperpotassemia. These findings indicate that relatively mild changes in electrolyte concentration are not associated with the direct effects of 2,4-DA on the mineralocorticoid function of the adrenals.

78-2461. Makarov, V. A.; Zavoronkov, N. I. (Moscow Vet. Acad. All-Union Inst. Exp. Vet. Med., Moscow, USSR) **Veterinarne sanitarni expertiza v SSSR pri otrave zvirat karbamatovymi pesticidy. [Veterinary and sanitary study in the USSR on the carbamate pesticide poisoning of animals.]** *Vet. Med. Prague* 22(6): 357-362; 1977. (7 references) (Czech)

Hogs, sheep and rabbits were fed varying levels of Sevin (1-naphtyl- *N*- methylcarbamate carbaryl), THTD (tetramethyl thiuram disulfide) and zineb (zinc-ethylene- 1,2-bisdithiocarbamate). One to 30 days following administration the animals were sacrificied and the carbamate residues in muscle tissue, clinical symptoms, bacteriological, and physical-chemical characteristics of the meat (pH, oxidation quotient, amino-ammonical N, effect of peroxidase, reaction with 5% CuSO4) were determined. The quantity of the carbamate administered had no effect on the time needed for its elimination, but elimination time differed for different animals. Pigs and sheep could be slaughtered 20 to 30 days following intoxication with the above carbamates, rabbits 7-12 days. Meat containing carbamate residues is inedible and neither long-term freezing nor boiling for 2 hr decomposed the residues. Sevin caused depression and loss of coordination. TMTD caused CNS depression by suppressing cellular redox processes. Zineb acted slowly and was gonado- and embryotoxic. Meat from animals slaughtered within 10 days following poisoning contained a much higher level of amino-ammoniacal N than meat from healthy animals. Bacterial contamination with cocci appeared usually 3 and more days after poisoning.

78-2462. Paulov, S. (Med. Fac., Komenski Univ., 886 04 Bratislava, Czechoslovakia) **Ucinky herbicidov (Gramoxone a Defenuron) na vyvoj a bielkoviny prepelic (*Coturnix coturnix japonica*). [Effects of herbicides (Gramoxone and Defenuron) on development and protein levels in the quail (*Coturnix coturnix japonica*).]** *Vet. Med. (Praque)* 22(7): 413-419; 1977. (14 references) (Slovak)

The effect of a 500 ppm aqueous solution of the herbicides Gramoxone (I) (active substance: 20% paraquat) and Defenuron 92 (II) (active substance: 92% fenuron) on the hatchability and hatching time of quail eggs was determined by dipping the fertilized eggs (from the 6th to the 11th day of incubation) in a 500 ppm aqueous solution of the herbicides. The effects of these compounds on protein synthesis and embryonic development were studied by administering the herbicides to hens in drinking water at 100 and 40 ppm levels. With I hatchability (in 80% control eggs) was reduced to 70%, and hatching time was prolonged by 1 day. Dipping in II had none of these effects. The herbicides had no effect on body weight of adult birds. Administration of I (100 ppm) in drinking water killed all birds within 1 week, and the 40 ppm level caused marked changes in the protein pattern of the blood serum (paper electrophoresis). Administration of II had none of these effects, even at the 100 ppm level.

78-2463. Nvota, J.; Horvath, J.; Tesarova, D. (Inst. Anim. Physiol., Slovak Acad. Sci., Ivanka pri Dunaji, Czechoslovakia) **Vplyv DDT, intenzivneho vyuzivania podlahovej plochy a post-inkubacnej zataze na vyvoj imunitnej odpovede u kurciat. [The effect of DDT, crowding and post-incubation stress on the development of immune responses in chickens.]** *Vet. Med. (Prague)* 22(9): 561-567; 1977. (12 references) (Slovak)

The levels of antibodies against Newcastle disease induced by vaccination 132 days after hatching were studied 2 wk after vaccination in three groups of cockerels, 30 birds per group. The first group was given DDT in diet at 100 mg/kg feed, the second group was fed the same DDT level and also stressed by crowding (rearing under conditions of 30 cockerels/m^2 floor space up to the age of 5 wk), and the third group served as controls. In addition, half of the birds in each of the first two groups was subjected to the additional stress of immobilization for 1 hr each day. The antibody level was assessed via the hemagglutination inhibition test. DDT administration raised the level of immunity to Newcastle disease. Simultaneous exposure to DDT and crowding slowed growth and the development of immunity. Administered alone, DDT did not affect weight gains. The additional stress of immobilization reduced the immunity level in both exposed groups.

78-2464. Belonozhko, G. A.; Tovtsenko, A. I.; Bezkrovnaya, E. V. (Lab. Hyg. Toxicol. Nematocides & Zoocides, All-Union Sci. Inst. Hyg. Toxicol. Pestic., Polymers & Plastics, Kiev, USSR) **Gigienicheskaya otsenka ostatochnykh kolichestv fungitsida euparena v pishchevykh produktakh. [Hygienic evaluation of Euparen residues in food products.]** *Vop. Pitan.* (2): 72-75; 1978. (3 references) (Russian)

Euparen (dichlofluanid) is an effective fungicide on grapes and strawberries. Following treatment the fruit contains residues of both the unchanged compound and its metabolite, *N,N'*-dimethyl- *N*-phenyl diamino sulfide. Residues in excess of 10 ppm of these substances will alter the taste of the fruit. The LD50 of Euparen in the rat is 4630 mg/kg, in the mouse 1905 mg/kg, and in the guinea pig 805 mg/kg. The cumulation coefficient at an administration rate of 1/20 LD50 is 3.7 in mice and 3.3 in guinea pigs. The threshold dose was determined to be 5.4 mg/kg in a 10-month chronic experiment. The metabolite was slightly more toxic and less cumulative then Euparen. It is recommended that a tolerance of 1.3 mg/kg be established for Euparen and its metabolite on grapes and that a zero tolerance level be set in strawberries.

78-2465. Karpenko, V. N.; Matokhnyuk, L. A.; Volkova, V. M. (Lab. Pestic. Toxicol. & Voc. Hyg., Res. Inst. Ind. Hyg. & Occup. Dis., Kiev, USSR) **Izmeneniya sosudov pri vozdeistvii ditiokarbaminovykh pestitsidov. [Changes in the blood vessels after exposure to dithiocarbamate pesticides.]** *Vrach. Delo* (4): 131-133; 1978. (Russian)

The effect of dithiocarbamate pesticides on the structure and permeability of blood vessel walls was studied on albino rats and rabbits. A single po administration of the pesticides zineb and, polymarcine (zineb, maneb ethyl thi-

uram disulfide) and betanal (phenyredipham) at maximum permissible doses did not induce changes in the blood vessel wall. Maneb caused slight increases in the blood vessel permeability (4 min, compared with 7.5 min in controls). Chronic exposure of rabbits to dithiocarbamates at 0.05-0.10 LD50 for 2.5 mo decreased the durability of the blood vessel walls (especially after exposure to maneb at 250 mg/kg), and caused slight hemorrhages in lungs, kidneys and heart.

78-2466. Chio, H.; Sanborn, J. R. (Illinois Nat. Hist. Survey, Agric. Exp. Stn., Univ. Illinois, Urbana, IL 61801) **The metabolism of atrazine, chloramben, and dicamba in earthworms (*Lumbricus terrestris*) from treated and untreated plots.** *Weed Sci.* 26(4): 331-335; 1978. (4 references)

The metabolism of three ^{14}C-ring-labeled herbicides, atrazine [2-chloro- 4-(ethylamino)-*s*- 6-(isopropylamino)- *s* -trazine], chloramben (3-amino- 2,5-dichlorobenzoic acid), and dicamba (3,6-dichloro- *o*-anisic acid) was studied in the earthworm, *Lumbricus terrestris* L., taken from plots treated with these herbicides for the past 10 yr and from control plots treated with no herbicides. For the two benzoic acid herbicides, acetone extracts of sand and earthworms from untreated plots contained more unmetabolized herbicide than similar extracts of sand and earthworms from treated plots, indicating a net enhancement of metabolism in worms from treated plots. For atrazine, the amount of unchanged herbicide in the acetone extracts of earthworms and sand were nearly equivalent. Finally, the relative metabolic stability of the three herbicides in decreasing order in earthworms from both control and untreated plots was chloramben > atrazine > dicamba. (Author abstract by permission)

78-2467. WHO Expert Committee on Insecticides, Geneva, Switzerland **Resistance of vectors and reservoirs of disease to pesticides.** *WHO Tech. Rep. Ser. 585* pp. 7-88; 1976.

The greatest problem in combatting vector-borne disease has been the increasing resistance to pesticides. When the use of organochlorine insecticides was abandoned because of resistance, the more expensive organophosphorus and carbamate compounds were used as replacements; however, cases of resistance have already appeared. In this study, the present status of resistance, the impact of pesticide resistance on control vectors and reservoirs of diseases, procedures for detecting and measuring resistance, further research needs and alternative chemicals such as pyrethroids, biodegradable organochlorine insecticides, and insect development inhibitors are discussed. Future vector control policy to counteract the problems of resistance is also discussed.

78-2468. Bedford, C. T.; Crayford, J. V.; Hutson, D. H.; Wiggins, D. E. (Shell Toxicol. Lab. (Tunstall), Sittingbourne Res. Cent. Sittingbourne, Kent ME9 8AG, England) **An example of the oxidative de-esterification of an isopropyl ester. Its role in the metabolism of the herbicide flampropisopropyl.** *Xenobiotica* 8(6): 383-395; 1978. (12 references)

The major metabolite of the wild oat herbicide, flamprop-isopropyl, is the carboxylic acid formed by the loss of the isopropyl group. Peripheral hydroxylation also occurs in the *N*-benzoyl group. The two metabolites (A and B) discussed in this paper are the products of hydroxylation at the isopropyl group. The identities of these metabolites are confirmed by synthesis and mass spectrometry. Model oxidation studies were also carried out using isopropyl acetate, and results agree with other evidence indicating that the de-esterification of isopropyl carboxylates proceeds via initial hydroxylation.

78-2469. Mametkuliev, Ch. (Lab. Pestic. Toxicol., Inst. Nutr., Moscow, USSR) **Izuchenie embriotoksicheskogo i teratogennogo svoistv gamma-izomera GKhTsG v opytakh s krysami. [Study of embryotoxic and teratogenic properties of the gamma isomer of HCH in experiments with rats.]** *Zdravookhr. Turkm.* 20(3): 28-31; 1978. (6 references) (Russian)

The potential embryotoxic and teratogenic effects of the common pesticide, γ-BHC (lindane) was studied in rats. The impregnated female rats were divided into four groups; a solution of lindane in vegetable oil was given po at 25 mg/kg (groups 1-3) or at 12.5 mg/kg (group 4). Animals in groups 1 and 4 received lindane throughout pregnancy (from day 1 to day 20), rats in group 2 received lindane throughout the period of placentation and organogenesis (days 7-15), and rats in group 3 received lindane during the preimplantation period (days 1-7). On day 20 of pregnancy rats were sacrificed and the embryos were examined. Lindane lacked a teratogenic effect in all experimental groups; the total number of corpora lutea per female in groups 1, 2, 3 and 4 was 13.7, 14.3, 9.8 and 13.5, compared to 10.7 in control females. Females in group 1 showed increased postimplantation death of the embryos: 25.6%, compared to 11.2% in group 2, 7.6% in group 3, 9.5% in group 4 and 13.2% in nontreated controls.

See also 78-2281, 78-2282, 78-2283, 78-2284, 78-2285, 78-2286, 78-2287 78-2288, 78-2290, 78-2291, 78-2297, 78-2298, 78-2304, 78-2316 78-2318, 78-2319, 78-2327, *and* 78-2352.

78-2470. Tchan, Y. T.; Chiou, C. M. (Dep. Microbiol., Univ. Sydney, Sydney, NSW 2006, Australia) **Bioassay of herbicides by bioluminescence.** *Acta Phytopathol. Acad. Sci. Hung.* 12(1-2): 3-11; 1977. (5 references)

The bioluminescence of photobacteria is a detection technique suitable for herbicide bioassays. The toxic effect of acrolein to luminous bacteria (*Photobacterium phosphoreum* strain T_3) was determined by measurement of the optical density. The method is suitable for concentrations of acrolein from 0.005 to 1 ppm. The influence of the herbicides diuron, neburon, atrazine, simazine, and bromacil on oxygen production was determined via the bioluminescence. An equal volume of T_3 and *Dunaliella tertiolecta* was added to the herbicide solution. After the light emission stopped, the sample was exposed to a light source, and the luminescence was measured via the optical density. The sensitivity of the method is 0.001 to 1 ppm for diuron, 0.05 to 1 ppm for neburon, 0.05 to 2 ppm for atrazine, 0.1 to 4 ppm for simazine, and 0.005 to 1 ppm for bromacil. The advantages of the bioluminescence method are simplicity and speed. [Presented at 1976 meeting of the Hungarian Academy of Sciences]

78-2471. Smyth, M. R.; Smyth, W. F. (Dep. Microbiol., Colorado State Univ., Fort Collins, CO 80523) **Voltammetric methods for the determination of foreign organic compounds of biological significance.** *Analyst (London)* 103(1227): 529-567; 1978. (254 references)

A review is given of the applications of polarographic and other voltammetric methods of analysis. These methods are used in the determination of foreign organic compounds in drugs, food, and water, in the determination of pesticides, and for toxicology studies. Organic compounds are examined according to functional groups, type and mechanism of the reactions, and the voltammetric method used in analysis. These organic compounds include disulfides, dithiocarbamates, sulfur oxides, nitrogen oxides, amines, amides, heterocyclic *N*-compounds, aldehydes, ketones, phenolic compounds, organic acids, alcohols, sugars, halogen compounds, organophosphorus compounds and organometallics. Comparisons of other analytical techniques are included.

78-2472. Burchfield, H. P.; Storrs, E. E. (Res. Assoc., New Iberia, LA) **Residue analysis.** In: *Antifungal Compounds.* Siegel, M. R.; Sisler, H. D.; eds. (New York: Marcel Dekker, Inc.): 1: 463-505; 1977. (135 references)

Methods of analysis for fungicide, insecticide and herbicide residues are basically similar. These methods generally include extraction and cleanup of the residues, and gas-liquid chromatography, high pressure liquid chromatography (HPLC), colorimetry, or fluorimetric analysis of the extracts. General cleanup and extraction methods are discussed. The basic principles, characteristics and uses of gas-liquid chromatography (including electron capture detectors (ECD), electrochemical detectors, flame photometric detectors (FPD), and alkali flame ionization detectors (AFID)), and high pressure liquid chromatography are examined. Specific methods for the analysis of active halogen compounds (including *s*-triazines, quinones, and captans), antibiotics, benzene derivatives (such as chlorine compounds, dexon and dinitrophenol derivatives), fumigants (haloalkanes and Vapam [mettam-sodium]), heterocyclic fungicides, metal compounds, organic bases and organophosphates are examined in detail.

78-2473. Sagredos, A. N.; Eckert, W. R. (NATEC Gesellsch. Naturwissensch. Tech. Dienste mbH, Hamburg, Germany) **Methoden zur Bestimmung von Phytopharmaka in Tabak und Tabakerzeugnissen. II. Mitteilung: Zur Simultanbestimmung von hexanloeslichen Organophosphor- Pflanzenschutzmitteln. [Methods of determining pesticides in tobacco and tobacco products. Part 2. Simultaneous determination of hexane-soluble organophosphorus pesticides.]** *Beitr. Tabakforsch.* 8(7): 447-454; 1976. (5 references) (German)

An analytical method for parallel determination of hexane-soluble organophosphorus pesticide residues in vegetables anf fruits was worked out for tobacco and tobacco products. Tobacco is extracted with a mixture of hexane and acetone; the extract is cleaned up on an alumina column and analyzed on a gas chromatograph equipped with a flame photometric detector. Quantitative evaluation was accomplished by comparing peak heights with those of test solutions of known concentrations (reproducible results can be obtained only when peaks are of approximately similar height). Of about 30 organophosphorus pesticides used by tobacco growers approximately half are easily soluble in hexane. The above method was found to be suitable for the quantitative determination of residues of chlorfenvinphos, fenitrothion, fenchlorphos, fenthoate, chlorpyrifos, methyl parathion, parathion, phorate phosvel (leptophos), phosalone, ethoprophos, methidathion, salithion and tetrachlorvinphos. The recovery rate was between 75 and 124%, and the detection limit was between 0.01 and 1 ppm.

78-2474. Stein, V. B.; Pittman, K. A. (Inst. Comp. & Hum. Toxicol., Albany Med. Coll., Albany, NY 12208) **Loss of mirex on evaporation of aqueous solutions.** *Bull. Environ. Contam. Toxicol.* 19(6): 755-757; 1978. (3 references)

Attempts have been made to assess the large losses of mirex occurring during concentration of aqueous solutions containing mirex. Solutions of mirex in various organic solvents were evaporated to dryness using various methods. Evaporation using a rotary evaporator was the most convenient. Various organic solvents (methanol, acetone, ethanol, ethyl acetate, petroleum ether, acetonitrile, and hexane) containing mirex were evaporated to dryness and the percent recovery was determined to be near 100 %. The data obtained indicate that losses of mirex can be expected if aqueous solutions containing mirex are allowed to evaporate. Therefore the necessary precautions should be taken when concentrating mirex in aqueous solutions containing organic solvents.

78-2475. Drygas, M. (Inst. Org. Ind., P-03236 Warsaw, Poland) **Metoda oznaczania pozostalosci bromfenwinfosu w**

materiale zwierzecym. [Determination of bromfenvinphos residues in animal tissues and in milk.] *Chem. Anal. (Warsaw)* 22: 517-522; 1977. (3 references) (Polish)

A gas-chromatographic method for the quantitative determination of bromfenvinphos in animal tissues and in milk is described. Bromfenvinphos is extracted from meat and fat with *n*-hexane, the extract is cleanup up with acetonitrile, and bromfenvinphos is determined on a florisil column with an alkali flame ionization detector. The detector temperature is 240°C, the column temperature 210°C. Promofenvinphos is determined in milk by simultaneous extraction and clean-up on florisil column. The lowest limit of detectability is 0.0025 ppm. The detector readings are linear in the concentration range of 0.1-100 ng. The recovery rate amounts to 92%.

78-2476. Fournier, E.; Sonnier, M.; Dally, S. (Exp. Toxicol. Unite, INSERM, Hop. Fernand Widal, U26, Paris 10, France) **Detection and assay of organophosphate pesticides in human blood by gas chromatography.** *Clin. Toxicol.* 12(4): 457-462; 1978. (10 references)

Gas chromatography was used to detect organophosphate pesticides in blood samples. Three groups of patients were studied. One group was comprised of patients who had been poisoned by parathion, trichlorfon, dichlorvos, or dimethoate. The second consisted of professional sprayers who had been exposed to dichlorvos, malathion, or parathion. The control group consisted of professional sprayers who had been exposed to pesticides other than organophosphate insecticides. Gas chromatography was found to be a satisfactory method for identifying the compound responsible in acute or subacute poisoning. Because organophosphate compounds are highly reactive, the identification and assay of organophosphates in the blood is difficult beyond 48 hr after exposure when using this method.

78-2477. Phillips, D. J. H. (Fish. Res. Stn., Aberdeen, Hong Kong) **Use of biological indicator organisms to quantitate organochlorine pollutants in aquatic environments — A review.** *Environ. Pollut.* 16(3): 167-230; 1978. (187 references)

The use of the chlorine content in biological indicator organisms to monitor the comparative pollution of aquatic areas by organochlorine insecticides and polychlorinated biphenyls is reviewed. Methodological considerations pertaining to the use of these indicators are detailed and include body lipids, age, size or weight, sex and the sexual cycle, interactions of accumulated organochlorines affecting retention and storage of these compounds, diet, chemical interactions or metabolism of organochlorines before uptake by the chosen indicator organisms, salinity and water temperature. The majority of the available information on the effects of such variables on the results of indicator surveys for organochlorine pollutants concerns teleost species. However, some data are available for bivalve molluscs, crustaceans and marine mammals such as seals. The use of avian indicators is not considered in this review. Pesticides referred to include aldrin, BHC, chlordane, DDD, DDE, DDT, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, lindane, methoxychlor, mirex, parathion, propanil, carbaryl, solan, temefos and toxaphene. It is concluded that the use of biological indicators is open to criticism and that surveys should be designed more carefully than they have been in the past, particularly concerning the sampling of biota.

78-2478. Bramlett, C. L. (US PHS, FDA, San Francisco, CA) **High performance liquid chromatography of chlorophenoxyacetic acids, polychlorinated phenols, dinitrobutyl phenol, dinitro cresol, and pentachloroanisole.** *EDRO SARAP Res. Tech. Rep.* 1 (Paper 52-74): 1-30; 1976. (12 references)

High performance liquid chromatography (HPLC) was evaluated as an analytical tool for the determination of pentachlorophenol and chlorophenoxyacetic acid herbicides in non-fatty foods. The compounds considered in the evaluation include 2,4-D, 2,4,5-T, 2,4,5-TP, MCPA, 2,4-DB, 2,3,6-TBA, PCP, 2,4-dichlorophenol, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, 2,3,4,6-tetrachlorophenol, DNBP (dinoseb), DNOC, and pentachloroanisole. After cleanup using sodium hydroxide and water and extraction using sulfuric acid and ethyl ether, samples were injected into a 2.5 cm i.d. glass column packed with 40 g basic Al_2O_3. The residue was chromatographed using a UV detector. A complete discussion of the problems encountered during this study is included. This method is suitable for screening of most of the tested compounds at less than 0.1 ppm. Limitations are imposed by interference due to crop residues. Further work with HPLC is suggested to fully explore the potential of this method.

78-2479. Laski, R. R. (US PHS, FDA, Buffalo, NY) **Multiresidue determination of nitrogen containing herbicides and fungicides.** *EDRO SARAP Res. Tech. Rep.* 2 Paper 43-74): 1-22; 1977. (12 references)

The use of existing multiresidue pesticide methodology for the analysis of organonitrogen herbicides and fungicides on raw agricultural commodities was investigated. It was concluded that the inclusion of nitrogen herbicides and fungicides into FDA's multiresidue screening program will have to be based on a method that is rapid and requires minimum manipulation, due to the instability and volatility of the residues being sought. A procedure involving acetone extraction and gel permeation chromatography (GPC) cleanup is outlined in this study and has these advantages as well as the potential of expansion to include many other classes of compounds, possibly evolving to a multipesticide residue method for raw agricultural commodities.

78-2480. Draskovics, I.; Marton, A. F.; Kulcsar, F. (MEM Food Inspect. & Chem. Res. Ctr., Budapest, Hungary) **Oldoszer- es reagens- szennyezok zavaro hatasa a klorozott szenhidrogenszer maradvanyok meghatarozasanal. [Interference by solvent and reagent contaminants in the determination of chlorinated hydrocarbon pesticide residues.]** *Elelmiszervizsgalati Kozl.* 23(4): 186-193; 1977. (6 references) (Hungarian)

Gas chromatographic and thin-layer chromatographic investigations were conducted on interferences in the determination of organochlorine pesticide residues. Both analytical grade reagents and chromatographic sorbents were found to contain materials which interfered with the determination of lindane, *p,p'*-DDT and *p,p'*-DDE following solvent extraction and column chromatographic cleanup. Suggestions for purification of reagents are given, and methods of checking the efficacy of purification are mentioned.

78-2481. Kucher, A. G.; Rakov, A. A.; Sapegin, D. I. (Crimea Med. Inst., Simferopol, USSR) **Opredelenie khlororganicheskikh pestitsidov v rape ozer i limanov. [Determination of organochlorine pesticides in natural salt lakes and estuaries.]** *Gig. Sanit.* 43(4): 78-79; 1978. (3 references) (Russian)

A modified assay for determination of organochlorine pesticides in the brine (concentrated solution of various mineral substances, including iodine and bromine) of saline lakes and estuaries is described. The technique consists of repeated extraction of brine samples (100-200 ml) with *n*-hexane (15 ml), evaporation of the excess hexane, and thin-layer chromatography in the presence of two standard (one containing a low concentration of the pure preparation and the other containing a high concentration). The density of the spots is measured with a microphotometer.

78-2482. Hotchkiss, J. H.; Barbour, J. F.; Libbey, L. M.; Scanlan, R. A. (Dep. Food Sci. & Technol., Oregon State Univ., Corvallis, OR 97331) **Nitramines as thermal energy analyzer positive nonnitroso compounds found in certain herbicides.** *J. Agric. Food Chem.* 26(4): 884-887; 1978. (16 references)

Certain dialkyl nitramines have been shown to elicit a false positive response on the thermal energy analyzer (TEA). The TEA is a detector specifically employed in the analysis of samples for trace amounts of nitrosamines. Dipropylnitramine (DPNO) was responsible for a TEA false positive peak in the analysis of a widely used herbicide formulation containing α,α,α-trifluoro- 2,6-dinitro- *N,N*-dipropyl-*p*-toluidine. In addition, the presence of dipropylnitrosamine at a concentration of 130 mg/kg in the herbicide was confirmed. The molar response ratio of DPNO compared to dipropylnitrosamine was 0.50. In addition, DPNO was Griess reagent positive, UV sensitive, and had a similar retention time to dibutylnitrosamine on Carbowax 20M. Nitramines are almost certainly responsible for unknown TEA positive peaks in other herbicide formulations. Nitramines might be mistakenly identified as *N*-nitroso compounds, especially where mass spectral confirmation is not made. (Author abstract reprinted by permission of the American Chemical Society)

78-2483. Arjmand, M.; Hamilton, R. H.; Mumma, R. O.* (Pestic. Res. Lab., Pennsylvania State Univ., University Park, PA 16802) **2,4,5-Trichlorophenoxyacetic acid. Synthesis and thin-layer chromatography properties of amino acid conjugates and gas-liquid chromatography and mass spectra of methyl ester derivatives.** *J. Agric. Food Chem.* 26(4): 898-902; 1978. (19 references)

Fourteen amino acid conjugates of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) were synthesized and characterized by thin-layer chromatography. The methyl esters of the conjugates were prepared and analyzed by gas-liquid chromatography (GLC) and by mass spectrometry. A GLC method was developed employing a 2% OV-1 column and temperature programming conditions that could be used to analyze for 13 of the conjugates. All the methyl ester derivatives of the conjugates exhibited mass spectral fragmentation patterns characteristic of the specific conjugate and most compounds gave molecular ions. (Author abstract reprinted by permission of the American Chemical Society)

78-2484. Brockwell, C. A. (Australian Gov. Anal. Lab., Melbourne 3000, Australia) **Determination of phosphine in wheat by headspace gas-liquid chromatography.** *J. Agric. Food Chem.* 26(4): 962-964; 1978. (5 references)

A relatively fast gas chromatographic method has been developed for the determination of residual phosphine (PH_3) in wheat. The phosphine was released by grinding the grain in a gas-tight blender jar. After equilibrium had been reached, samples from the headspace gas were injected directly into the gas-liquid chromatograph and measured against standards. (Author abstract reprinted by permission of the American Chemistry Society)

78-2485. Moseman, R. F.; Ward, M. K.; Crist, H. L.; Zehr, R. D. (Anal. Chem. Branch, Environ. Toxicol. Div., Health Effects Res. Lab., US EPA, Research Triangle Park, NC 27711) **A micro derivatization technique for the confirmation of trace quantities of Kepone.** *J. Agric. Food Chem.* 26(4): 965-968; 1978. (20 references)

A rapid and simple procedure has been devised for the confirmation of nanogram quantities of Kepone (chlordecone) that is sensitive to part per billion levels in environmental and biological samples. Electron-capture gas chromatography of the perchlorinated derivative enabled confirmation often not possible by other techniques such as gas chromatography combined with mass spectrometry. Conversion of Kepone to mirex was accomplished by a high-temperature closed-tube reaction. Mirex that might have been present in the original sample extract was separated from Kepone by a micro Florisil column cleanup step. The absence of mirex in cleaned-up sample extracts was verified during the electron-capture gas chromatographic quantitation for Kepone. The conversion of Kepone to mirex was quantitative, allowing for the estimation of Kepone by a separate technique. Thus, considerable confidence is added to analytical results. Details of the methodology and results obtained are discussed. (Author abstract reprinted by permission of the American Chemical Society)

78-2486. DiPrima, S. J.; Cannizzaro, R. D.; Roger, J. C.; Ferrell, C. D. (Thompson-Hayward Chem. Co., Kansas City, KS 66110) **Analysis of diflubenzuron residues in environmental samples by high-pressure liquid chromatography.** *J. Agric. Food Chem.* 26(4): 968-971; 1978. (4 references)

Residue methods for the routine analysis of diflubenzuron in a wide range of samples from both agricultural and nonagricultural ecosystems were developed. The procedures involve Celite liquid-liquid partition, and Florisil- alumina-silica gel column chromatography, followed by detection using high-pressure liquid chromatography (HPLC), with a μ-Bondapak C-18 (reverse phase) or μ-Porasil (normal phase) column. The methods are reproducible and sensitive to 0.01 ppm in water and 0.05 ppm in soil, sediment, aquatic and forest foliage, fish and shellfish, agricultural crops, milk, eggs, and animal tissues. (Author abstract reprinted by permission of the American Chemical Society)

78-2487. Arjmand, M.; Hamilton, R. H.; Mumma, R. O. (Pestic. Res. Lab., Pennsylvania State Univ., University Park, PA 16802) **Separation of amino acid conjugates of 2,4-dichlorophenoxyacetic acid by high-pressure liquid chromatography employing ion-pair techniques.** *J. Agric. Food Chem.* 26(4): 971-973; 1978. (14 references)

A high-pressure liquid chromatographic procedure was developed for the analysis of 15 amino acid conjugates of 2,4-dichlorophenoxyacetic acid (2,4-D). The procedure employs a μ-Bondapak C_{18} column with a methanol:water solvent and the use of ion-paired chromatography. The method is sensitive (< 50 ng) and quantitative over a wide range (50 ng to 100 μg), and conjugates are easily recoverable. (Author abstract reprinted by permission of the American Chemical Society)

78-2488. Belliardo, F.; Nano, G. M.; Arzone, A.; Vidano, C. (Univ. Torino, Turin, Italy) **Rapid determination of carbaryl residues in honeybees by high-pressure liquid chromatography.** *J. Apic. Res.* 16(4): 197-200; 1977. (20 references)

A simple, precise, rapid and direct high-pressure liquid chromatography (HPLC) procedure is reported for the analysis of residues in honeybees of both carbaryl and 1-naphthol. Clean-up on a Florisil column after extraction of carbaryl and its derivatives removes many sources of interference associated with biological materials. Major advantages derived from the high-pressure liquid chromatography method in comparison with paper, thin-layer (TLC), and other chromatography methods include the introduction of samples to the column without any elaborate pretreatment; short time required for analysis; high sensitivity in determining traceamounts of pesticides in a variety of biological materials; the fact that any residue can be measured as one peak, thereby enhancing sensitivity and simplifying final measurement; and the fact that samples containing excessive residues can be diluted and reinjected.

78-2489. Wright, L. H.; Lewis, R. G.; Crist, H. L.; Sovocool, G. W.; Simpson, J. M. (Health Eff. Res. Lab., EPA, Research Triangle Park, NC 27711) **The identification of polychlorinated terphenyls at trace levels in human adipose tissue by gas chromatography/mass spectrometry.** *J. Anal. Toxicol.* 2(3): 76-79; 1978. (21 references)

Composite samples of human adipose extracts representing the general United States population were examined by gas chromatography/mass spectrometry. Cleanup of the sample by gel permeation chromatography significantly improved detection capabilities. Samples had been previously cleaned up by a modified Mills-Onley-Gaither (MOG) procedure. Samples were cleaned on a gel permeation chromatograph equipped with a 350 cm x 25 mm (i.d.) glass column with 200/400 mesh SX-3 BioBeads. Toluene in ethyl acetate (1:3) was used for elution. The initial eluate was discarded, and the subsequent eluate fraction was reduced to 10 ml. Analyses were done on a mass spectrometer equipped with a gas chromatograph and data system. Twenty-eight resolvable polychlorinated biphenyls were identified, along with β-BHC, DDT, DDE, oxychlordane, and heptachlor epoxide. The method allows the resolution of polychlorinated terphenyls and three additional components of technical chlordane. This method may be useful in further analyses for polychlorinated terphenyls in the environment.

78-2490. Pacakova, V.; Kozakova, H. (Dep. Anal. Chem., Charles Univ., 128 40 Prague 2, Czechoslovakia) **Determination of 1,3,5-triazine herbicides by gas chromatography.** *J. Chromatogr.* 154(2): 251-255; 1978. (20 references)

A gas chromatographic method for the determination of 1,3,5-triazine herbicides is described. Gas chromatography measurements were carried out on a Hewlett-Packard 5700A instrument equipped with flame ionization detection. The stainless steel column was packed with a mixture of 2% Reoplex 400 and 5% SE-30 supported on Chromaton and operated at 195° with nitrogen carrier gas at a flow rate of 40 ml/min, an injector temperature of 220° and a detector temperature of 195°. Determination of *sym*-triazines in herbicide preparations is described. Determination of atrazine in soil was also carried out.

78-2491. Lam, S.; Grushka, E. (Dep. Chem., State Univ. New York at Buffalo, Buffalo, NY 14214) **Separation of permethrin and some of its degradation products by high performance liquid chromatography.** *J. Chromatogr.* 154(2): 318-320; 1978. (20 references)

Analysis of permethrin and some of its degradation products is described using high pressure liquid chromatography (HPLC) on a reversed-phased system. The use of a reversed-phase system is especially useful for the analysis of metabolites since in mammals, permethrin is quickly hydrolyzed and enzymatically converted to more polar compounds which are excreted from the body within a short time. The procedure described offers a great advantage in the case of less stable pyrethrins which would usually undergo thermal isomerization or decomposition during the gas-liquid chromatographic analysis.

78-2492. Cody, J. T. (Sci. Educ. Cent., Univ. Iowa, Iowa City, IA 52242) **Identification of pesticides leached through soil.** *J. Coll. Sci. Teach.* 6(5): 306-307; 1977. (5 references)

Pesticides and herbicides may be leached from the site of application by rain water or ground water. Runoff of pesticides can be prevented by proper management, while the leaching down of pesticides in soils is difficult to stop. An experiment for classroom use demonstrates the leaching and movement of pesticides in soils. Thin layer chromatography is used to separate and identify common soil pesticides. After cleanup and treatment with hexane and sodium sulfate, the pesticide sample is placed on a silica gel chromatographic plate (2.5 by 10 cm) and developed in a mixture of *n*-heptane and acetone (50:1). The spots are fixed with silver nitrate and 2-phenoxyethanol and UV light. This method is suitable for identifying DDT, DDE, lindane, toxaphene, dieldrin and most chlorinated hydrocarbons.

78-2493. Nowicki, T. W. (Can. Grain Comm., Grain Res. Lab., Winnipeg, Manitoba R3C 369, Canada) **Gas-liquid chromatography and flame photometric detection of phosphine in wheat.** *J. Assoc. Off. Anal. Chem.* 61(4): 829-836; 1978. (17 references)

A screening method using gas-liquid chromatography with flame photometric detection has been developed for determining phosphine in wheat. Phosphine is measured as the sum of physically bound intact phosphine and that derived from residual aluminum phosphide. Wheat is extracted in a closed, partially evacuated glass system by refluxing with 10% sulfuric acid. Liberated gases are swept into a gas-collection flask fitted with rubber septa to permit gas sampling. Aliquots of collected gas are injected into a gas chromatograph. Phosphine is quantitated by peak area as determined by an electronic integrator. Recoveries varied with concentration: 67% was recovered at 0.10 ppm and 98% was recovered at 19 ppm. For concentrations less than 1.5 ppm, the coefficient of variation was 9.95%. Using flame photometric detection, phosphine concentrations as low as 0.04 ppm were easily determined in wheat. (Author abstract by permission)

78-2494. Vasileva-Alexandrova, P. S.; Shishmanov, P. S. (Dep. Anal. Chem., Inst. Food & Technol., Plovdiv, Bulgaria) **Use of some mono- and ditetrazolium salts as spectrophotometric reagents for determination of "Gardona".** *Mikrochim. Acta* 1(3/4): 219-227; 1977. (13 references)

The procedure, reaction conditions and applications are described for determining Gardona (tetrachlorovinphos) with a comparatively rapid and sensitive spectrophotometric method using tetrazolium salts. The tetrazolium salts tested included methylthiazoly tetrazolium chloride (MTT), iodonitro tetrazolium chloride (INT), triphenyl tetrazolium chloride (TTC), nitroblue tetrazolium chloride (Nitro-BT), tetranitroblue tetrazolium chloride (TNBT) and neotetrazolium chloride (NT). The procedure involves mixing the tetrazolium salt, sodium hydroxide, distilled water and Gardona solution; keeping the mixture at 50-70°C for 40-50 min; cooling to room temperature; and comparing its absorbance against a blank containing ethanol instead of Gardona. Reproducible results were found with synthetic samples of polluted river water using MTT, Nitro-BT and TNBT, but not with INT. Reproducible results were also found using Nitro-BT in determining Gardona in apples.

78-2495. Sherma, J. (Dep. Chem., Lafayette Coll., Easton, PA) **Manual of analytical quality control for pesticides and related compounds in human and environmental samples.** *Natl. Tech. Inform. Serv.* PB-261,019: 289p.; 1976. (367 references)

This manual primarily provides the pesticide chemist with a systematic protocol for control of analytical procedures which arise in the analysis of human or environmental media. The sections dealing with inter- and intra-laboratory quality control, the evaluation and standardization of materials used, and the operation of the gas chromatograph are intended to highlight and provide advice in dealing with many problems which constantly plague the pesticide analytical chemist. Aspects of the problem areas involved in extraction and isolation techniques for pesticides in various types of samples are discussed. Techniques for confirming the presence or absence of pesticides in sample materials are treated. A short dissertation of the value and need for systematic training programs for pesticide chemists is presented. (Author abstract by permission)

78-2496. White, E. T.; Martin, D. F.; Lee, G. W.; Leung, L. S. (Dep. Chem. Eng., Univ. Queensland, Brisbane, 4067 Australia) **A truck mounted adsorption unit for fumigant emission control in grain silos.** In: *Proceedings of the International Clean Air Conference.* White, E. T., Hetherington, P., Thiele, B. R., eds. (Ann Arbor: Ann Arbor Science Publishers): pp. 255-263; 1978.

Laboratory tests were performed to evaluate the feasibility of an adsorption technique for recovering organic fumigants used to reduce pest infestation in grain storage. Grain such as wheat stored in silos has to be protected against damage by pests (weevils) by periodic fumigation with fumigants such as methyl bromide. The emission of these organics into the atmosphere can be reduced by an adsorption recovery unit. The proposed unit is comprised of three adsorption beds, an LPG fired burner to release the fumigant, and necessary instrumentation and control. Adsorption and desorption trials were carried out. Laboratory measurements were carried out with a column of a suitable adsorbent to determine adsorption isotherms and kinetic data. Break-through curves were obtained by passing mixtures of air and methyl bromide through the packed bed of adsorbent held in a constant temperature gas-chromatograph oven, and analyzing the effluent gas continuously with a flame ionization detector. Inlet gas concentrations and operating temperatures were varied. The carbon showed a high adsortive capacity, being capable of adsorbing up to 20% by weight of methyl bromide, and excellent temperature characteristics. Based on these experiments, a unit was designed with one ton of adsorbent arranged in

three beds, each 1.7 m in diameter and 0.3 m deep. A 90% recovery of methyl bromide was expected. In heating the adsorbent to desorb the methyl bromide, approximately 5 kg of LPG is required for each silo. Preliminary costing of the unit built of 316 stainless steel gave a capital cost of 20,000. The value of the recovered methyl bromide (100/silo) makes this treatment economically attractive.

78-2497. Iohan, F.; Zugravescu, M. (Author address not given) **Aplicarea cromatografiei in strat subtire pentru controlul puritatii carbarilului. [Application of thin-layer chromatography for controlling carbaryl purity.]** *Rev. Chim. (Bucharest)* 28(9): 889-893; 1977. (42 references) (Rumanian)

A TLC method is described which allows for possible detection of impurities that are found in technical carbaryl. These impurities include 1-naphthol, 2-naphthol, dinaphthylcarbonate, dimethylurea, methylamine hydrochloride, dimethyl aniline, other amines, and their derived products. Several samples may be proportioned simultaneously and rapidly by this method. The detection limit of analyzed compounds is on the order of 1-10 mg%, with a relative error of 5-10% for the method.

78-2498. Karkocha, I. (Res. Inst. Food & Commod., Natl. Inst. Hyg., Warsaw, Poland) **Oznaczanie pozostalosci chloramfenikolu w miesie. [Determination of chloramphenicol residues in meat.]** *Rocz. Panstw. Zakl. Hig.* 29(2): 193-195; 1978. (4 references) (Polish)

A method is described for determining chloramphenicol residues in meat. A minced sample of beef is suspended in a buffer at pH 7.0 and extracted with ethyl acetate. The acetate extract is evaporated, a mixture of acetonitrile and water (6:1) is added, and fat is removed by shaking with petroleum ether. Chloramphenicol is determined by thin-layer chromatography after the purified extract is diluted in absolute ethanol. The method determined 0.01 mg of chloramphenicol in 1 kg of meat, with a recovery rate of about 100%.

78-2499. Williams, C. B.; Lukens, H. R.; Levinson, S. A.; Dandliker, W. B. (IRT Corp., San Diego, CA) **The application of immunological techniques to the detection of organic contaminants of environmental concern.** *Trace Subst. Environ. Health* 10: 317-322; 1976. (3 references)

Innovative immunoassay methods are being investigated to improve the sensitivity, speed, and specificity of analysis and to reduce costs. Immunoassays are based on the occurrence of a reaction between a compound and a specific antibody prepared against it. The most common means for employing this technique is the competitive binding assay, in which the binding of a detectable (usually labeled) form of a test compound with a prepared antibody is first measured, and then the degree to which this binding is blocked by the presence of the unknown is recorded. Improved immunoassays are presented for diquat, hexachlorophene and DES. A fluorescent diquat derivative was prepared rather than adding a fluorescent label to the compound. The effectiveness of antibody production by New Zealand white rabbits injected with a diquat-ovalbumin solution was increased by bombarding the solution with ionizing radiation before injection to induce binding between the diquat and the protein carrier. Using immunoassay, trace organics can be rapidly detected in the ng/ml range, and increases in sensitivity to the pg/ml range are possible with improved antibody preparation. [At the 10th Annual Conference on Trace Substances in Environmental Health Sponsored by the University of Missouri Environmental Trace Substances Research Center.]

78-2500. Dolmanova, I. V.; Zolotova, G. A.; Mazko, T. N.; Dymshakova, G. M.; Trunov, P. P. (M. V. Lomonosov State Univ., Moscow, USSR) **Kineticheskie metody opredeleniya mikrokolichestv seroorganiches-kikh soedinenii. [Kinetic methods for determining trace amounts of organosulfur compounds.]** *Zh. Anal. Khim.* 32(4): 807-811; 1977. (4 references) (Russian)

An assay for determining trace amounts of organosulfur compounds (OSC) is described. The technique is based on the inhibitory effect of OSC on the reaction of *p*-phenetidine oxidation with periodate in the presence of 2,2′-dipyridyl. The average resolution of the method for the detection of thiourea, cysteine, a series of dithiocarbamates, and some organosulfur pesticides was 10 ng/ml in a detection range of 6 to 60 ng/ml.

See also 78-2295 *and* 78-2322.

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